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Applying Chromium Plating for Appearance and Wear

By FRANK W. CURTIS
Western Editor, American Machinist

CHROMIUM plating applied to metals, such as iron, brass and steel, has two outstanding features, one appearance and the other wear and corrosion resistance. In either case the electro-plate process is the same, closely resembling that used for nickel plating.

Chromium-plating solutions have two recognized constituents, chromic acid and chromic sulphate, the chromic acid acting as a chromium reservoir, and insuring by cathodic reduction a constant supply of trivalent chromium ions in the form of chromium sulphate from which the chromium is actually deposited.

Tanks used for plating are constructed of welded sheet steel, having a glass lining for insulation purposes. The tank size can, of course, be varied in accordance with the nature of the work to be handled. Parts to be plated are connected to the cathode, which is the negative (—) connection of the circuit, while the anodes, consisting of pieces of sheet lead hung on a rack and projecting into the solution, form the positive (+) connection. Ventilation of the tanks must be provided to take off the fumes and fine spray carried out by the strong evolution of hydrogen at the cathode and of oxygen at the anode. Generally speaking, the units of a chromium-plating tank are heavier and larger in proportion than those used for ordinary plating. As in the operation of most plating solutions, it is necessary to success that three factors be carefully adjusted, these being acidity, temperature, and current density. Satisfactory results depend upon the selection of a proper temperature for any given current density. By changing the temperature and the current density with respect to each other, different types of chromium plating can be obtained, ranging from a frosty deposit, or "matte," resembling a soft gray color, to a beautifully brilliant, smooth deposit, bluish in appearance.

For ordinary plating a temperature of 104 to 122 deg. F. is used, the preferable temperature ranging about 113 deg. F. Low-voltage generators are used, inasmuch as the tank voltage is held to about 6 volts for ordinary plating. Approximately ten times the amount of current used for nickel plating is required for chromium plating, but in this respect the cost is a small factor.

The value of chromium plating depends not alone upon the process employed but also upon the science, the care and the integrity of its application. This science involves a thorough understanding of the chemical and physical properties of chromium, and the metal to which it is applied. Successful chromium plating, when applied for appearance, depends largely upon the preparation of the work prior to plating. It is essential to have the surface to be plated extremely smooth, inasmuch as slight scratches are inclined to be "magnified" when plated. For this reason exceeding care must be taken when buffing articles to be plated with chromium. In certain instances where a chromium-plated article needs buffing, it is necessary to bear harder against the rag buff and to use a special buffing composition having a chromic-oxide base. This procedure is carried out for such parts as automotive accessories, plumbing fixtures, electrical appliances,

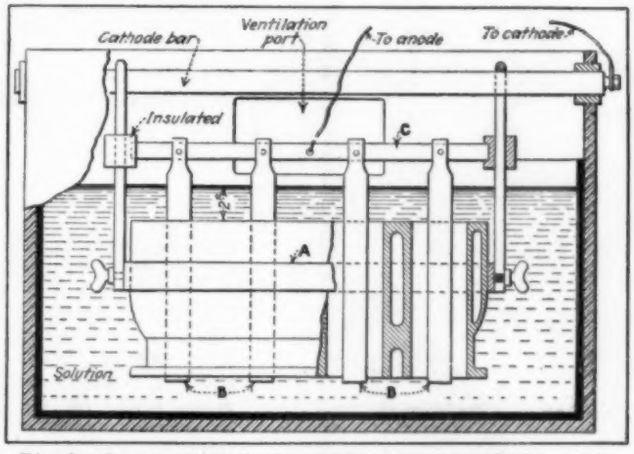

Fig. 1—Constructional view of a chromium-plating tank, showing the anode and the cathode connections. The body of the tank is constructed of welded sheet-steel and fitted with a glass lining. The solution consists of a chromic-acid base. Anodes are deposited in the tank in a manner similar to that used in nickel plating. For cylinder blocks, such as shown, the anodes are placed within the bores only; therefore the remaining sections are left immune with the exception of a slight "leak over" on the top face

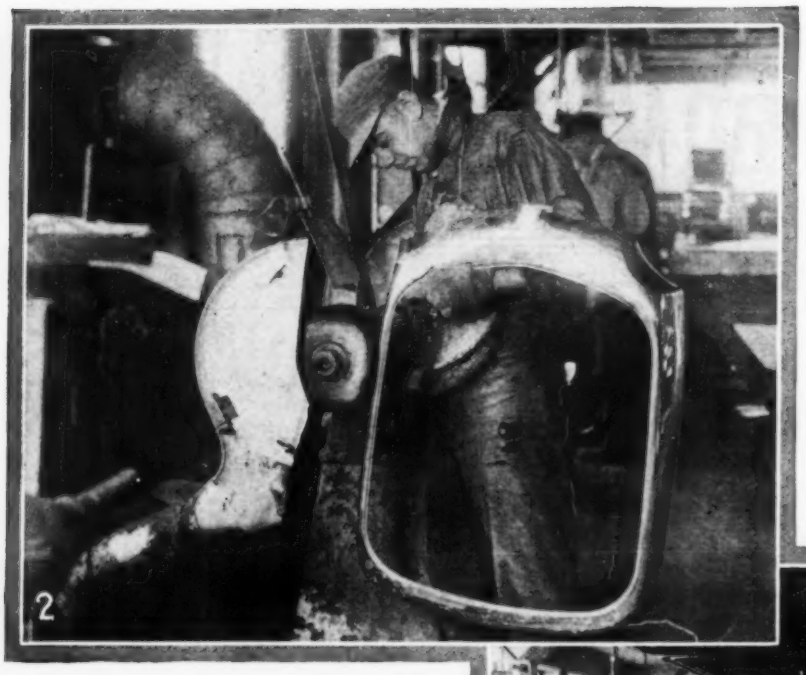

Fig. 2—In buffing such parts as radiator shells, preparatory to plating, it is essential to polish the surface smoothly, inasmuch as slight scratches are reproduced in the plating. A special rouge having a chromic-acid base is used. The shell shown is nickel plated first, then rebuffed, after which a deposit of chromium plating approximately 0.0005 in. is applied. Work of this nature remains in the plating bath about 5 min., and does not have to be buffed after the chromium has been applied

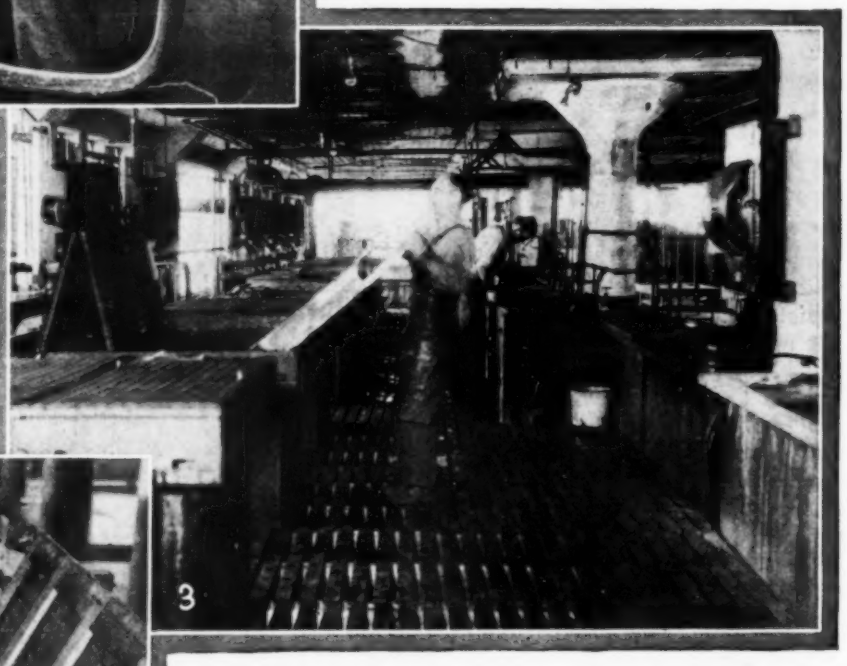

Fig. 3—Clamps are attached to shells, then they are submerged in the acid bath. The current is not turned on, however, until the work has been dipped in the acid and the tank cover closed. After plating, the shells are rinsed in a warm-water bath and then in a hot-water bath

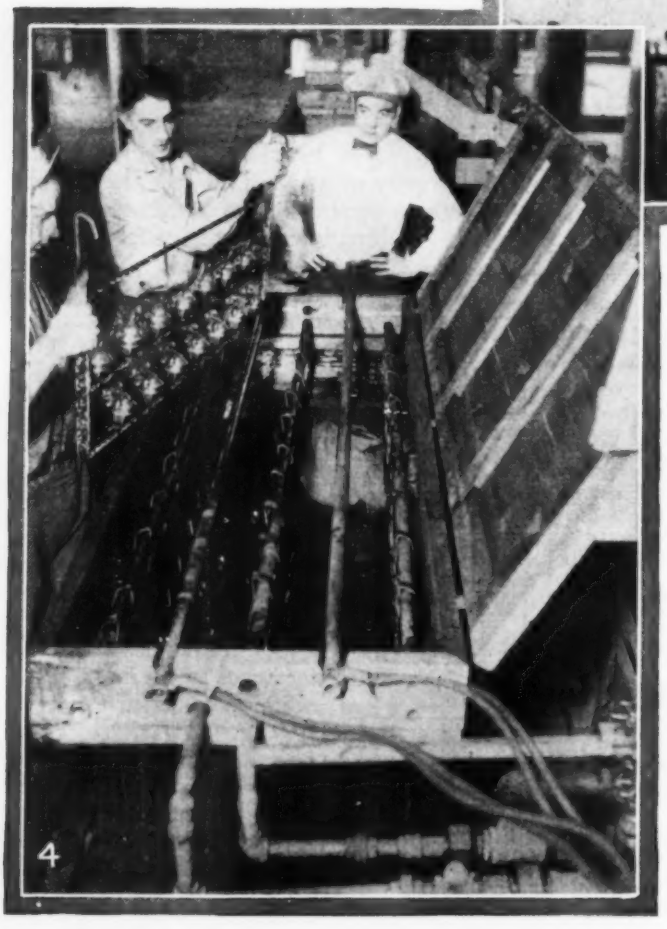

Fig. 4—Smaller parts are plated in group form by hanging several pieces on a rack that is connected to the cathode circuit. The three bars set slightly below the top of the tank carry the lead anodes. Parts such as cams, bearings and sleeves, chromium plated for wearing qualities, are given a deposit of from 0.001 to 0.003 in. in thickness, whereas parts such as plug gages and bushings plated for the purpose of rebuilding worn surfaces, receive a deposit varying in thickness up to 0.01 inch

Fig. 6—Parts requiring plating on certain portions only have those surfaces exposed while the remainder is coated with a protective lacquer. The lacquer has qualities enabling it to withstand the acid bath. Here the operator is seen coating small crankshafts that require plating on the pin bearings

Fig. 7—Another method of protecting odd shaped parts is to wrap electrician's tape over the surface requiring protection, and then apply a thin coat of lacquer, as shown, which represents a boring bar that is to be built up at the center section only

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Fig. 5—Ventilation of chromium tanks is essential in order to carry off the fumes and fine spray created by the evolution of hydrogen at the cathode and of oxygen at the anode. Ventilation ports are located at the center portion of the rear walls of the tanks

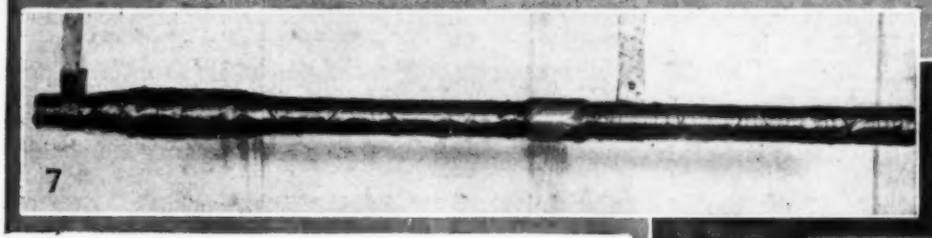
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Fig. 8—Chromium-plated articles do not tarnish, require no polishing, resist wear and resist heat. Inspection of plated surfaces of parts finished for appearance is largely visual, while a measurement inspection is made of units built up for reconditioning purposes. Copper sulphate applied to a plated surface does not affect chromium, but if a bare spot exists, such as bare steel, that surface takes a copper stain, indicating that it has not received a deposit. Only two acids, impure sulphuric and hydrochloric, affect a chromium plated surface

tableware, surgical instruments, hardware, and other metal products. Chromium-plated articles do not tarnish, require no polishing, resist wear indefinitely as long as the continuity remains unbroken, and resist intense heat, its melting temperature being over 3,000 deg. F. Chromium plating will not take to aluminum, or readily to cast surfaces of iron and steel. There are only two acids, impure sulphuric and hydrochloric, that chromium plating does not resist.

Chromium deposits vary in thickness in accordance with the nature of the work, but for appearance purposes the deposit is generally between 0.0002 and 0.0005 in. Examples of such plating are radiator shells, bumpers and hub caps. On parts such as bearings, cams and automotive units, to be plated with chromium for wearing qualities, the deposit varies from 0.001 to 0.003 in. Such parts as gages, which are chromium plated for the purpose of rebuilding worn surfaces, receive a deposit varying in thickness up to 0.01 in. Deposits even greater in thickness can be applied if necessary, say up to 0.014 in., but in most cases the thicknesses mentioned cover the average requirements.

Added Life

Chromium plating gives additional life to parts subjected to wear. It can be applied to the walls of automotive cylinders with a deposit so thin that the piston fit is unaffected, and yet it adds materially to the life of these parts. When used in recovering worn units, it offers an economic saving.

In considering the diamond as the hardest of known materials at the value of 10, on the Moh hardness scale, chromium by the same rating is given the value of 9, a hardness greater than that of glass. Chromium plating is harder than any other commercial metal surface, but the base metal to which it is applied must be relatively hard to give it support, otherwise under great stress the chrome surface will become distorted or broken.

A sectional view of a chromium-plating tank, showing the method of making connections, is illustrated in Fig. 1. The work shown is a cylinder block supported by the hand *A*, which in turn is connected to the cathode, or negative circuit. The lead anodes *B*, forming the negative circuit, are attached to the bar *C*, which is insulated from the cathode connection. Approximately 2 in. should be allowed between the solution line and the top of the work.

When only a certain section of a unit requires plating that portion is left exposed and the remainder of the part can be coated with a protective lacquer having qualities that enable it to withstand the acid bath. In some cases, however, gum-rubber hose can be placed over the portion of the part requiring protection, such as the handle of a plug gage, while still another method is to wrap the surface not requiring plating with electrician's tape, and then coat the tape with lacquer. After being plated the work is dipped in an alkali cleaner, which dissolves the lacquer so that it can be removed easily. When the rubber hose or tape is used it is merely necessary to peel them off first, then dip the part in the cleaner.

In chromium-plating tanks, the anodes are disposed in much the same manner as are nickel anodes in a nickel-plating tank. In the case of automotive cylinder blocks, the anodes are placed within the bores only. As these are the only portions to be plated the remaining sections are not affected and do not require protection. As a rule, the plating will slightly "leak over" the top face, but this condition is not objectionable in the majority of cases, although it can be remedied by merely coating the surface with lacquer.

In chromium plating parts such as radiator shells, experience has shown that it is better to apply a deposit of nickel first, and then apply chromium as the final finish. Chromium readily adheres to the nickel plate and forms a superb luster and, likewise, the nickel plate forms a smoother surface on which to apply chromium than the base metal, unless excessive buffing is resorted to. This procedure is not necessary on all parts plated for appearance or for tarnish-proof purposes, but it has certain economic advantages. Shells are buffed, as shown in Fig. 2, and then nickel plated, after which the final buffing removes all scratches and produces the desired smooth surface for the chromium plate.

After being prepared in this manner, clamps are attached to the shell, then it is hung in the chromium-acid bath, after which the current is turned on. Several tanks for this class of work are illustrated in Fig. 3. On account of the height of the tanks, a sub-platform is built around them to facilitate loading and unloading. Such shells are chromium plated in approximately 5 min., after which they are rinsed first in a warm-water bath and then in a hot-water bath, to remove the excess acid.

The loading of a group of radiator ornaments into a chromium-plating tank is illustrated in Fig. 4. The work is attached to a rack that in turn is hung on one of the two cathode bars shown connected to the negative circuit. The three bars set slightly below are the anode bars which are connected to the positive circuit at the opposite end of the tank, and which carry the lead anodes. Ventilation ports, of which one is provided for each tank, may be seen in Fig. 5, located at the center portion of the rear walls. The tank covers are lowered over the tanks as soon as the work has been loaded.

Plating Small Parts

Examples of work being prepared with the protective lacquer are illustrated in Fig. 6 in which may be seen an operator applying the preparation to a small crankshaft requiring plating only on the pin-bearing surfaces. Other work shown on the bench includes small drawing dies, a plug gage and several sprockets. The boring bar illustrated in Fig. 7 is shown prepared for chromium plating. It has three cutter sections, but only the center one is to be plated to rebuild the undersized surfaces. Approximately 0.005 in. of chromium is to be applied, which will require close to 10 hr. time. The balance of the bar is wrapped with tape, and coated with lacquer.

Inspection of worn parts, such as gages plated for reconditioning purposes, includes visual and measurement inspection. For work plated for appearance, however, the inspection is largely visual. If any particular spot looks doubtful, it is smeared with copper sulphate. This acid does not affect the chromium plate but if a bare spot exists, such as bare steel, it takes a copper stain. A general view of the inspection department is illustrated in Fig. 8, showing miscellaneous work undergoing visual inspection.

The information given and the photographs shown were obtained through the courtesy of the General Chromium Corporation, Detroit, Michigan.

Aluminum paint reflects 60 per cent of light. That is what makes it good policy to use it in shops where it is suitable.

To Move or Not to Move

WILLIAM HOLLAND was in his office, even though it was after hours, and the rest had gone. It's often the way of the "old man" of a concern, he seems to get a lot of ideas by sitting quietly after the rush of the day is over. Otherwise young Charlie Mason wouldn't have found him in when he came for a little advice.

"My name is Mason, Mr. Holland, and Jack Shepard suggested that I come to you. I've got a little shop down town and the pirate who owns the property wants to jump my rent. My first impulse was to tell him to go to—and hunt another place. But on second thought I figured it might be cheaper to pay it. That's what I want your advice about, Mr. Holland—and I'm willing to pay for it."

"You've got the making of a good business man, Mr. Mason. Not because I'm wizard enough to tell you just what to do, but for not going off half-cocked and moving without counting the cost. Next, you're willing to consult an older man and pay for his experience."

"Shall I move, or not, Mr. Holland?"

"Not so fast, Mason. There are several things to consider. Is your work largely local or does it come to you from other localities?"

"Largely local, sir. I'm beginning to get more from the outside though. But why?"

"If it's largely local business you can better afford to pay more rent where you are. How much, depends on a lot of things. For unless you do a cash-and-carry business, you may have to count on the cost of getting work to your shop—and delivering it. It's mighty easy to overlook an hour's time here and a fifty-cent express charge there, but they all count up during the year. Then, too, even the Ford truck costs money to buy, to run and to replace, not to mention the boy's wages while he's running it. Any increase in these costs might as well be charged to rent, if you move. Of course it isn't exactly rent, but it is a charge that is made necessary by your attempt to save rent money."

"Are there any more reasons for staying and paying the higher rent, Mr. Holland?"

"Several more, Mason, and along similar lines. You are now fairly near the railroad station and also not far from the Walters Hardware Company. If you move where rents are lower it will cost you more money to buy supplies and material."

"They can't boost prices on me, Mr. Holland, just because I move away from them!"

"No, Mason, they won't boost prices, but it will cost you more to get the stuff delivered from the railroad or from the hardware store—if you go after it—and you will, especially when you are in a hurry. You'll find you have larger bills for gasoline, or trucking, and that the boy is in the shop much less than he is now."

"Anything else to consider, Mr. Holland?"

"One thing at least—though it probably will not affect your shop much unless it's bigger than I think—and that is the effect of the location on keeping your good men, or on getting new ones equally good. If a man likes a job well enough, moving the shop doesn't scare him if it's anywhere within reason. But, except in dull times, men are apt to be a bit 'choosy.' A poor location, too much time on the road night and morning, as well as the condition of the shop itself, have a bad effect on getting and holding men."

"Well, Mr. Holland, shall I move or not?"

"Son, I'm not a mind reader. I've told you the points to consider, but I couldn't tell you which way to decide without going into a lot of figures. You haven't even told me how much the rent is to be raised or how much rent you'll have to pay in a new district, or where you think you might move. You can probably figure it out yourself. If you want to show me details, I'll be glad to help all I can."

Executives are invited to discuss the problem involved in the foregoing case. Accepted contributions will be paid for.

(Discussion of preceding problems follows on next page)

EXECUTIVE FORUM

Discussion

Depreciation Reserves

Setting aside each year 20 per cent of the machine tool inventory as a reserve against depreciation and obsolescence is surely a sound fiscal policy for the average manufacturing concern. In order, however, to have the books accurately reflect the condition of the business, several precautions are advisable. Suppose that we have a machine which cost $1,000 eight years ago, against which we have been setting aside $200 each year in our reserve fund. We scrap the old machine, and invest the accumulated $1,600 in a modern high-production machine. As the old machine could have depreciated only $1,000 and not $1,600, the $600 difference represents an increase in the firm's assets, which may be capitalized. The books should show this increase.

The customary result of writing 20 per cent off the value of each machine in the plant each year is as follows: After five years, when the machine has presumably vanished from the books, it is rediscovered by some Sherlock Holmes in the accounting department, and put back on the ledger at a hastily-appraised value. The cycle of 20 per cent yearly depreciation then starts afresh. In view of these difficulties, it is very important that the charges for "Depreciation of Present Equipment" be clearly distinguished from those for "Reserve for New Equipment."

In handling such a reserve fund, it is highly important that the money be not only set aside by the bookkeeper, but be actually invested in new equipment. To be successful, this policy requires the backing of a management courageous enough to let no hard times or slack seasons starve the reserve fund. —C. S. HAZARD.

The state of the machine equipment of a concern is an index of the efficiency of the management of that concern. Poor and obsolete equipment may even make money for a concern under unusual conditions, but it cannot long continue to do so, and modern equipment would increase that profit many fold. Obsolete equipment may often lead to obsolete products, the newer and better products of modern equipment gradually driving the old from the market. Without a logical system of depreciation reserves as a safeguard, the self inflicted exile may become an actuality.

Depreciation reserves characterize a management that is looking ahead and logically planning for the future—a prime requisite for success in these days of rapid improvements and advances. Unless a skillful and opportune salesman happens to hit on a combination of circumstances that will get him favorable attention, it is very likely that the management which does not have them will hear about a new machine only when its competitors' use of it has cut heavily into its production and profits. With a definite allotment for new equipment periodically available, it is but natural that the management keep in ever constant touch with the machine tool market. This guarantees that if expansion becomes suddenly the order of the day it will be along the most profitable modern lines, and not simply a duplication of existing equipment. —PAUL BLACKMAN.

New Equipment Versus Expansion

Increased volume of business is always a temptation for the hard-hearted business man to momentarily lose his head and build himself a monument that all the world may see as an evidence of his success. I know an advertising man who started in a new field with practically his hat as his office during the first year. He did exceptionally well, and while he really should have had some kind of office space the first year, he did it up brown when he fitted out his first office. Not content, after six months, he moved into still larger and more pretentious quarters, and increased his force. Today, he is working harder than ever, not for himself, but to maintain the office and force his pride swept him into.

So it is with the manufacturer. He tends to regard volume of orders as his index, and increased floor space as the outward sign of success. If he will but analyze his business in terms of capacity through the years, using dollars of output per year over dollars invested in floor space and equipment, taking into account increased efficiency of machines, he will realize the fallacy that lies in regarding floor space as a simple index. If he does increase his building and naturally install the latest machinery in them, he will find too late that he cannot well afford to run the old machines with their relatively small output and large labor costs in competition with his own and his competitors' more efficient modern equipment. In the rare instances where his volume has increased beyond his own expectations, he can save himself by replacing the older machinery with new as he should have done in the first place. But if his estimate of increasing volume was correct or even just a little optimistic, he finds himself with floor space in his original buildings so equipped that he cannot profitably operate it or readily dispose of it except at a sacrifice.

—BERNARD F. MCCORMACK.

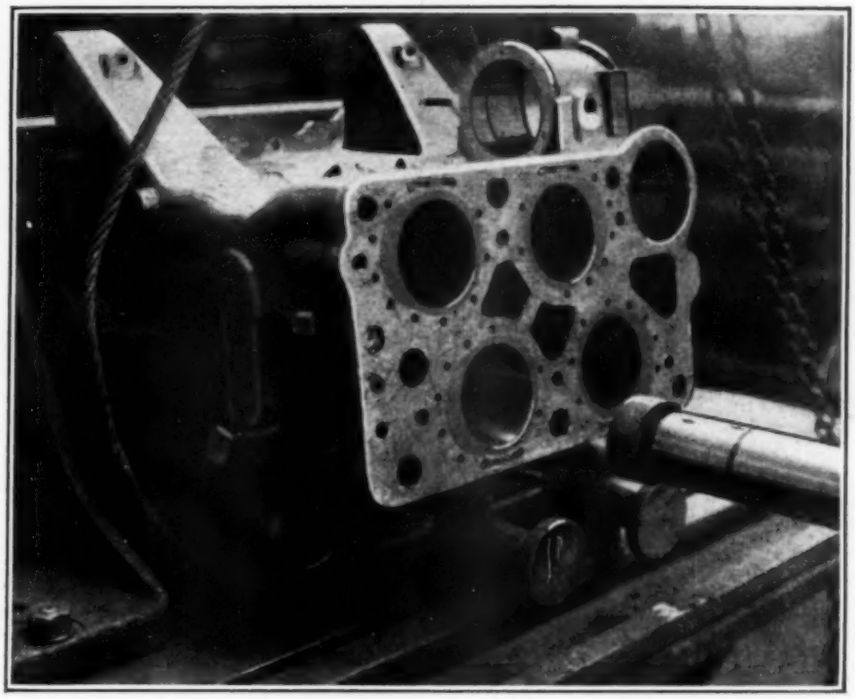


Fig. 13—Grinding the bores of the cast-iron cylinder inserts on a Brown & Sharpe cylinder grinder

Great care is taken to secure cylinder bores that are both smooth and accurate

Lancia Methods

of Machining Aluminum Cylinder Blocks

By J. A. Lucas

GRINDING the cylinders comes next, a Brown & Sharpe machine being used for the operation. The method of holding the cylinder block is shown in Fig. 13. This view also shows the irregular shape of the upper ends of the cylinders, which effectively prevents turning should they by any chance become loose in the block. The short length of the block, due to the staggering of the cylinders, makes a very compact engine. So compact in fact that both the engine and the transmission go under the hood, where they are accessible without getting under the car, or working through the floor.

On cylinders bored by the horizontal method, Figs. 5 and 6 (Part 1) there are two rough and one finish grinding operations, the latter with a very fine wheel. The total time is 2 hr. 20 min. per block. The cylinders bored on the vertical machine, however, are finish ground in one operation, owing to the smaller amount of material left for finish, reducing the grinding time to 1 hr. per cylinder block. Much of the time in both cases is spent in testing the accuracy of the bore. The final tolerance, taper and out of roundness are stated as being 0.005 mm.—or about "two-tenths." Fig. 14 shows the nine gages used. Three of these are pin gages, the others being flat measuring plugs on long handles and two full-sized plug gages.

The finish grinding of the tops of the cylinder blocks is shown in Fig. 15. The blocks are mounted on fixtures and are checked by the special height gage *A*. The stated tolerance is 0.01 mm. or about 0.0004 in. The grinding time is 10 min. A segmental wheel is used, and in Fig. 16 three of the segments and one of the wedge-shaped clamping bolts can be seen.

This operation about completes the actual machining. A few hand reaming operations that follow, show the care taken to secure accurate alignment and surfaces of bearings. For Mr. Lancia still believes that hand work is necessary to secure the highest grade of work. One of the hand reaming fixtures is shown in Fig. 17, where the control-shaft bearing is finish reamed with the fixture accurately located from the main bearings as at *A*. The guide bushing for the control-shaft reamer is at *B*. The reason for this care is to secure extreme accuracy in the

Conclusion of a two-part article.

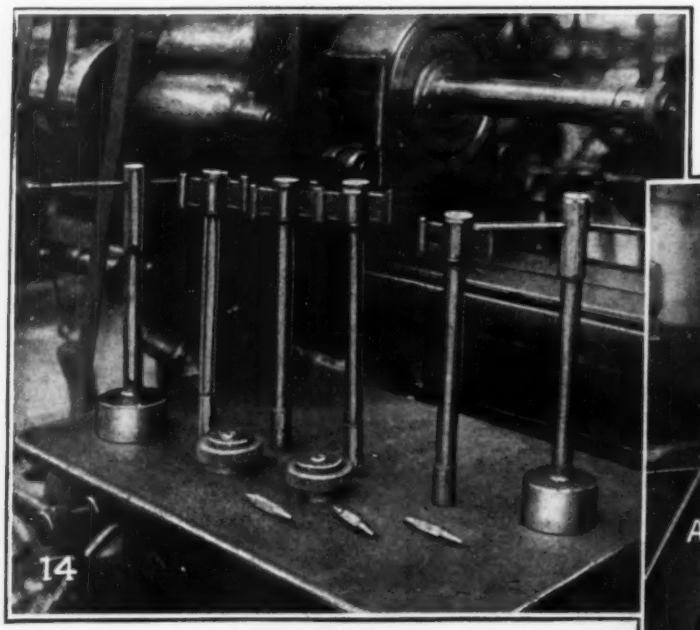


Fig. 14—The gages used in checking the cylinder bore for accuracy in diameter, roundness and taper. All of the nine gages shown are used in inspecting the cylinder bores

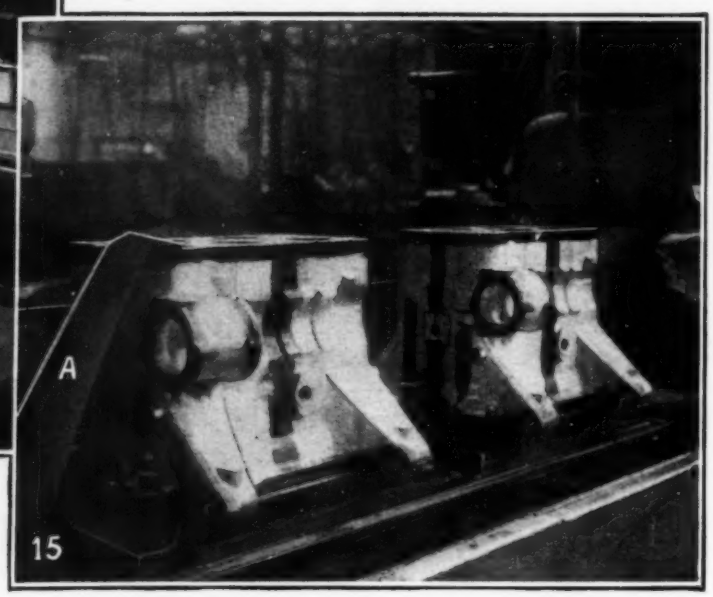


Fig. 15 — Finish grinding the tops of the cylinder blocks. Owing to the presence of two metals, the cast-iron cylinders in the aluminum block, grinding seems to be the only way of securing a uniform surface over the whole block. The height of the block is determined by the gage at the left

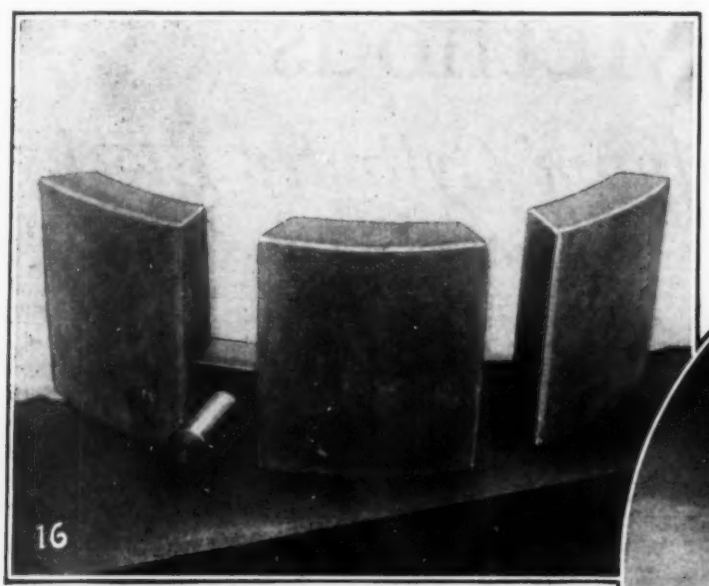


Fig. 16—Sections of the grinding wheel used and also one of the taper wedge blocks by which they are held in position in the wheel head

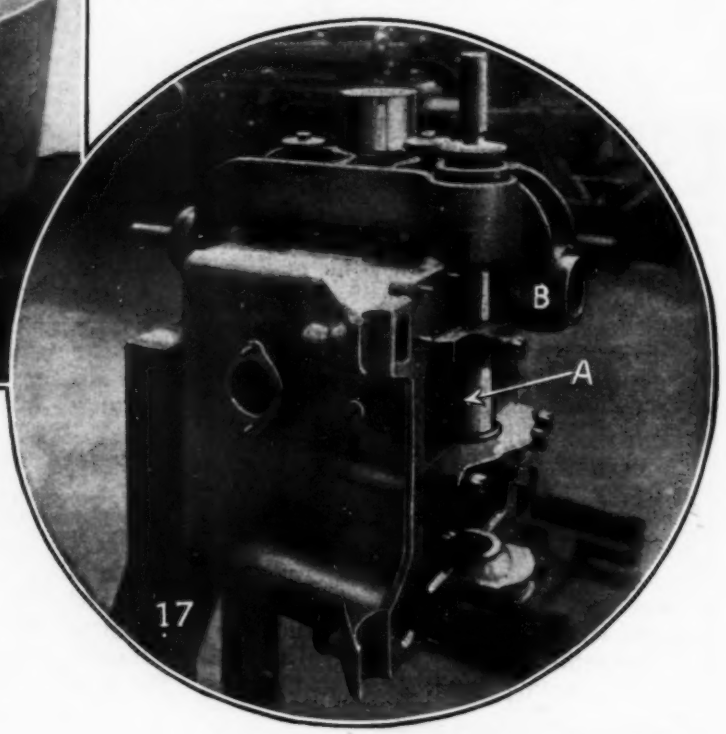


Fig. 17 — Fixture for hand reaming the cantrol-bearing. The fixture is located in two of the main crankshaft bearings and the reamer is guided by a substantial bushing in the arm, as shown

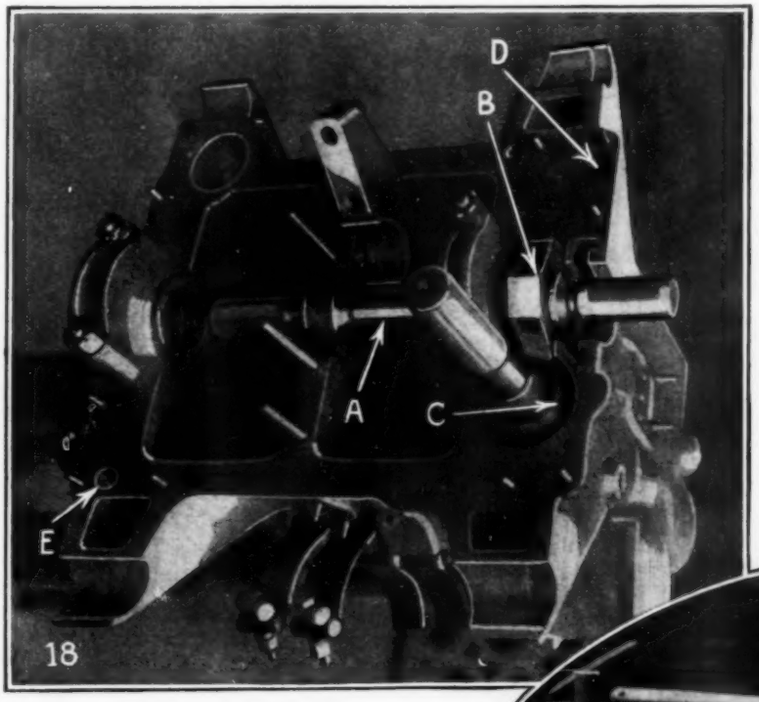


Fig. 18 — Checking the center distance between the control shaft and the main bearings. The four-lobed gage has a different dimension on each lobe and by revolving the gage and noting the contact of the lobes with the vertical plug, the exact center distance can be determined

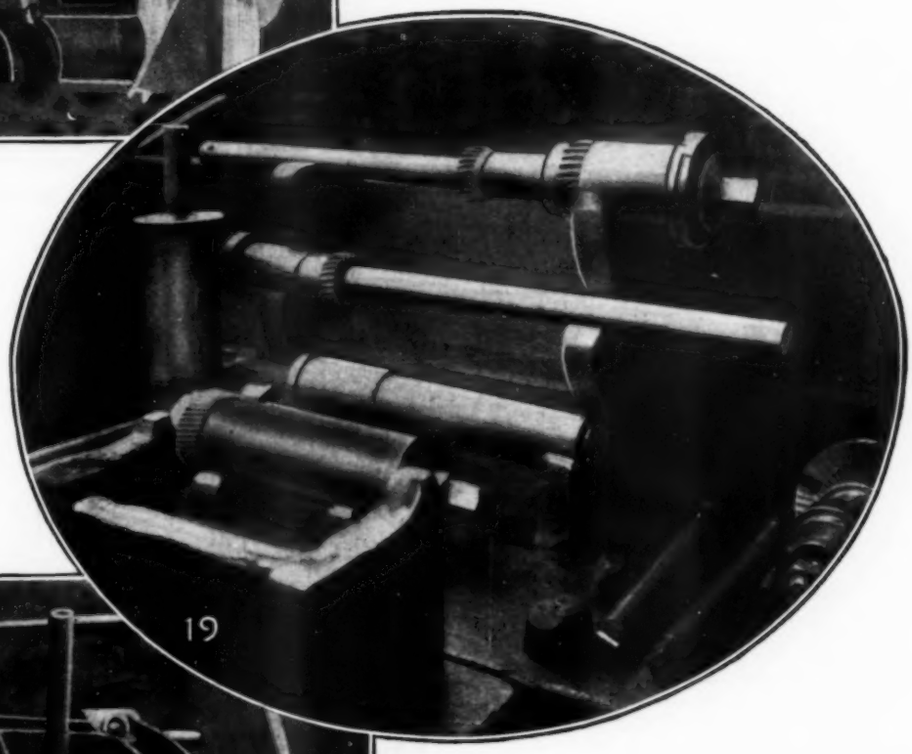


Fig. 19 — Various test mandrels used in scraping-in the different bearings. The gears on the mandrels mesh together and enable the workman to see the condition of the bearing under working conditions

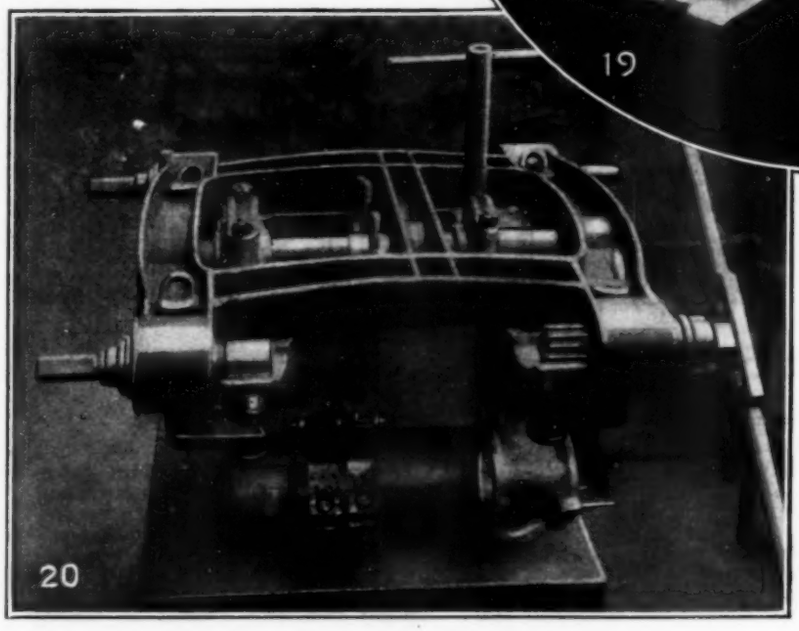
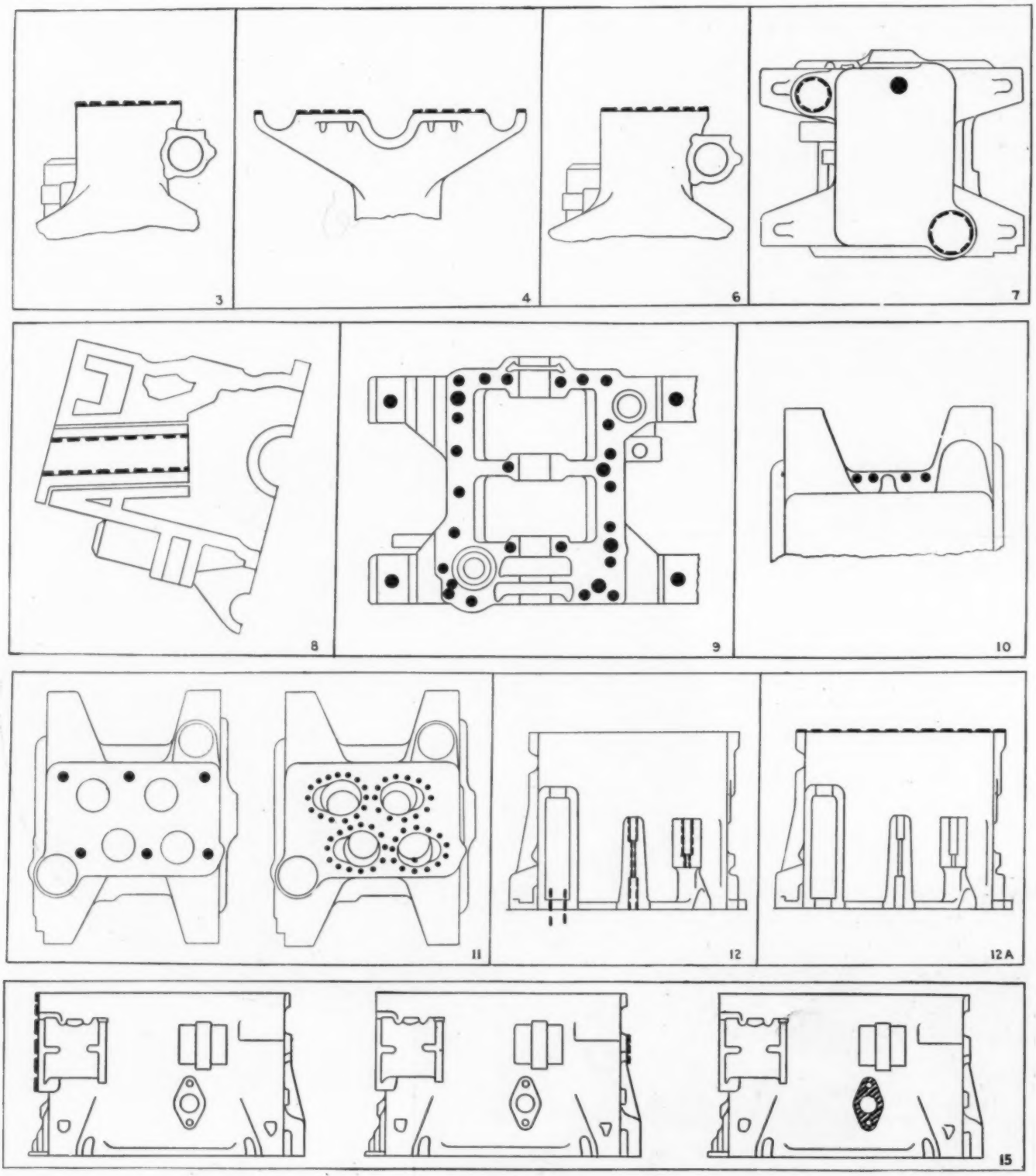
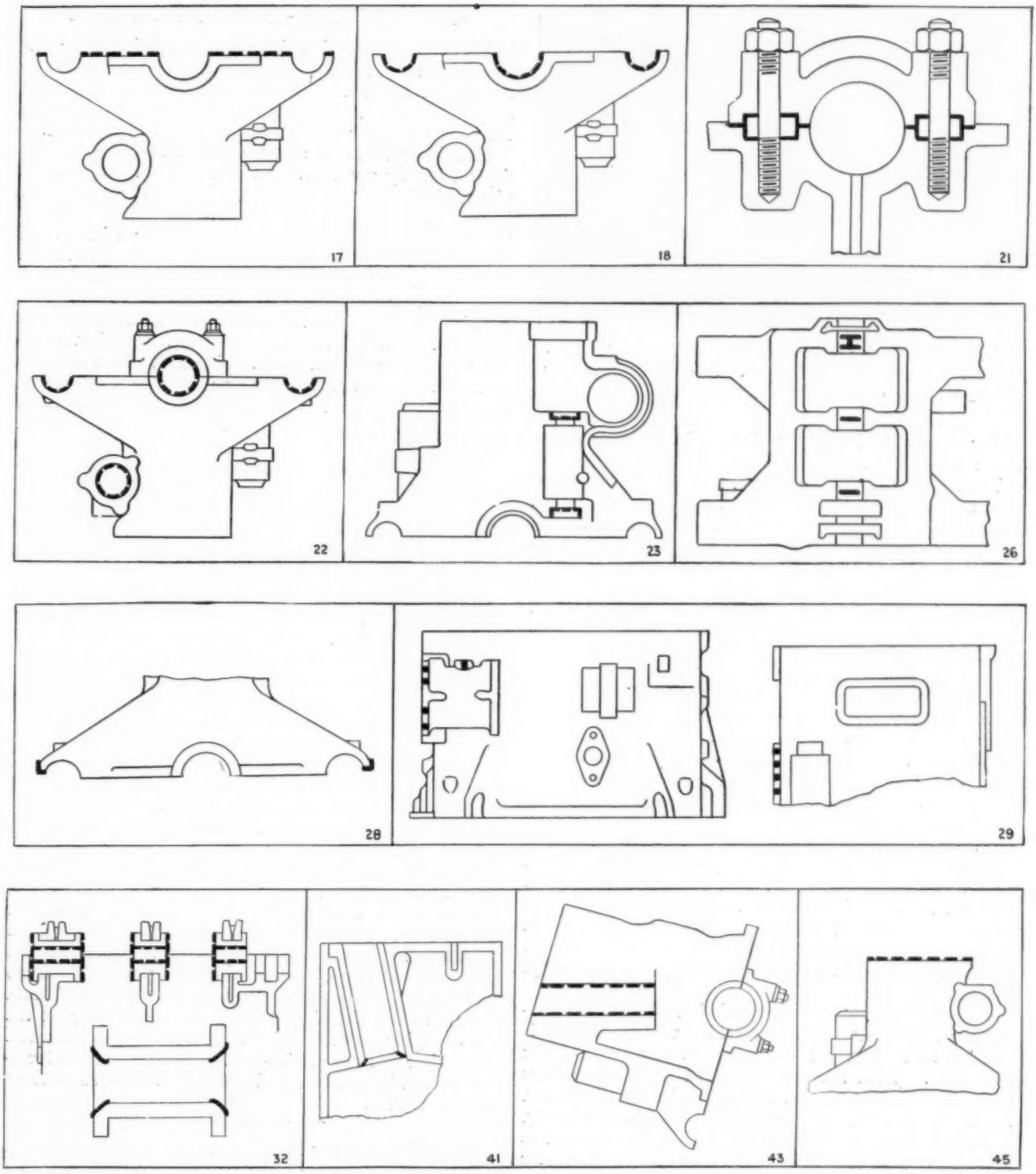


Fig. 20 — Fixture for final reaming the bearings in the arm that supports the motor on the tubes in the frame. The fixture is located from the crankshaft bearing



The diagrams show some of the major operations. The sequence of operations is given below

1—Inspection of castings. 2—Laying out and drilling for locating holes. 3—Rough milling upper surface. 4—Rough milling. 5—Hydraulic test. 6—Finish milling head, leaving 0.3 mm. for grinding. 7—Drilling locating holes on seat of filter. 8—Boring cylinder sleeve. 9—Drilling all holes in base. 10—Facing bolting bosses. 11—Drilling holes in top. 12—Reboring holes for oil filter. 12A—Finish grinding upper face. 13—Facing oil-gage seats. 14—Drilling side holes for water circulation. 15—Milling front and rear seat for oil gage and flange for water entrance. 16—Threading holes for cylinder head and bearing caps. 17—Grinding cylinder base. 18—Rough milling motor support and crankshaft bearing. 19—Inserting bearing cap. 20—Contour milling of cap. 21—Hand-fitting caps. 22—Boring seat for crankshaft bearing and water-pump housing. 23—Boring bearing for vertical timing-gear shaft. 24—Boring hole between seats—only when found necessary. 25—Drilling water circulating holes in head. 26—Milling transverse grooves on bearing



The diagrams show additional major operations. The sequence of operations is continued below

supports. 27—Milling longitudinal connecting grooves. 28—Milling ends of motor supports. 29—Drilling holes for location of water pump and oil gage. 30—Hand-reaming bronze bearing seats. 31—Fitting and assembling crankshaft bearings. 32—Truing faces of main bearings and chamfering the ends. 33—Hand-reaming ends of main bearings. 34—Inserting pipe for draining oil from cylinder head crank case. 35—Hand-reaming various holes. 36—Finish tapping. 37—Washing in kerosene. 38—Sealing water chamber with waterproof varnish. 39—Hydraulic water test. 40—Reaming sleeve. 41—Beveling bases of sleeves. 42—Washing in kerosene. 43—Rough and finish grinding sleeves. 44—Milling slots for water passage on head. 45—Grinding head. 46—Hand-reaming motor supports with special jigs. 47—Temporarily attaching aluminum base cover for general inspection. 48—General inspection.

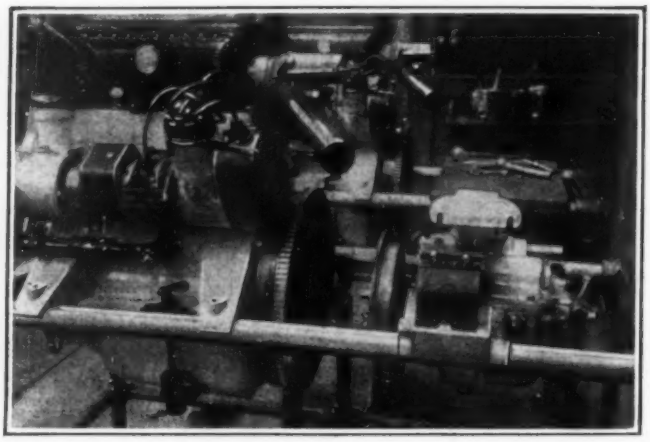


Fig. 21—Checking the concentricity of the mating surfaces of the flywheel and clutch. The indicator can be swung so as to check either surface

center distances of the gear shafts, the tolerance being about 0.0006 inch.

The method of checking center distance for the spiral gear shafts of the vertical control, is shown in Fig. 18. The gage *A*, is held in two of the main bearings. The four lobed gage at *B* contacts with plug *C* in the control-shaft bearing. Each of the lobes is of a slightly different radius, so that the exact center distance can be determined by noting the lobe that contacts with the plug *C*. These lobes vary by 0.010, 0.0125, 0.015 and 0.020 mm. or from 0.0004 to about 0.0008 in. This view also shows two of the locating dowel holes at *D* and *E*.

Some of the standard mandrels used in testing and scraping the bearings are shown in Fig. 19. The mandrels show how the gears mesh together, also the fit of the bearings. From 6 to 8 hr. is used in scraping the bearings. The slight changes in the aluminum casting due to the stresses imposed by clamping are removed by the care given to the scraping.

Some idea of the care used in securing the accurate alignment of the engine on its supporting tubes, by the final reaming, is shown in Fig. 20. The fixture is clamped in the main bearings and is positioned by the plugs in the ends of the arms. Removing one plug at a time each arm bearing is carefully reamed as shown, correcting any slight misalignment that may have crept in from any cause.

The alignment of the transmission supports is corrected in the same way and then the whole assembly is checked as in Fig. 21, to assure the alignment of the two units. With the units mounted on standard bars that represent the engine supports, the dial indicator, supported between the flywheel and the clutch housing, is used to check the truth of the face of the flywheel as it revolves with the crankshaft. The same gage checks the truth of the clutch face of the transmission unit. This testing fixture gives a good idea of the care taken to secure perfect alignment.

A complete list of the operations on a Lancia cylinder block is given herewith. The cuts taken in some of the operations are indicated in black on the small diagrams. The numbers on the diagrams correspond with the numbers in the list of operations.

Connecting-Rod Methods

THERE are still wide differences of opinion both as to designs and methods of making connecting rods for automobile engines. The use of duralumin or similar alloys is growing, but the material used does not affect the machining methods as much as might be expected.

Machining methods and the sequence of operations depend largely upon the type of rod used. Where the piston pin is clamped in the rod, the main requirement is to have the hole to size, the kind of finish not being very important. Where the piston pin bears in the rod the hole is bushed in nearly every case, although in some duralumin rods the pins bear direct in the rods.

In these cases the finish is very important and great care is taken to secure a bore of extreme smoothness and accuracy. The methods of finishing are broaching, reaming and boring with a single point tool, either steel or diamond. Each method has its advocates who usually oppose the other two. Those who finish by boring claim greater accuracy as to roundness and also more perfect alignment.

The machining of the large end also depends on the design. When the cap is a metal to metal fit, without shims, the hole is usually bored oblong so as to be round after the cap has been cut from the rod. Some, however, bore the hole round and use shims the thickness of the saw.

Another factor that affects machining is whether the babbitt bearing is cast in the rod or whether a bronze-backed shell is used. If the rod is babbitted direct—and this seems to be the latest practice on account of its conducting heat away more readily—the finish is not important. The main requirement is that it be near enough to size to locate the rod in the fixtures and be cleaned properly to insure the firm adherence of the tin and the babbitt. If a shell bearing is used, the rod should be ground or otherwise finished to be both round and smooth, as a support for the shell, and to better conduct the heat away. Some finish bore the bearings after they are in place.

With the large end babbitted the method of finishing varies. Broaching, reaming and boring are all used in this operation. All can be made to give a fine finish, but the question of alignment of the two holes must also be considered. Some finish the two ends as nearly parallel as possible and then straighten where necessary. Others feel that it is not good practice to kink or otherwise strain the rods after finishing, as there is a possibility of the rod changing under working temperatures and pressures. To obviate this some finish-bore as a last operation, locating the rod by one bore and cutting the other so as to be parallel with it.

Forty thousand passengers and large quantities of mail and freight are reported to have been carried by German air lines in 1926.

Automobile parts and accessory manufacture (not counting tires) employs nearly as many people as the automobile factories themselves. The auto industry employs 375,281 and the parts and accessories 320,000. Add 100,000 for tire factories and accessories top the list.

Details of Jigs and Fixtures

Design of Equalizers

By J. A. Potter

EQUALIZERS in tool construction are used to take care of the uneven surfaces on a casting or forging. They also form one of the methods of obtaining more than the three-point bearing by using a two-point bearing and the equalizer with two points. Equalizers can be used on all of the various types of fixtures and drill jigs. The several parts which go to make up jigs and fixtures, such as clamps, covers, jaws, latches and bars, are often equipped with equalizers to give an even pressure at two points. The equalizer itself is a small hardened steel piece, as it usually is in direct contact with the part to be manufactured, and therefore subject to considerable wear. A simple equalizer is shown in Fig. 1. This is the most familiar type, and has considerable freedom in its action. The equalizer is positioned sideways between two lugs, and swings on a pin. This same type can rest against a lug, and be supported on a shoulder screw if desired. In either case the pin, or shoulder screw, will be in double or single shear, respectively. In Fig. 2 is illustrated a backed-up equalizer. The back of the equalizer rests on the curved surface made by a milling cutter. The hole in the equalizer is made large to clear the pin which is used only to keep the equalizer from dropping out. This type will not work as freely as the one shown in Fig. 1, due to the friction on the curved surface in addition to that on the walls. The equalizer shown in Fig. 3 is free acting, and has none of the objectionable features of the ones shown in Figs. 1 and 2. The back of this equalizer rests in a milled slot, and the equalizer swings on the pin, which is backed up by the outer wall. The point of contact on the equalizer is opposite a point on the pin, which is positioned where the pin is backed up, thus placing the pin in compression and not in shear. This type is more expensive to construct than the others, but is warranted if many parts are to be made, or if upkeep on the tools is an item to be considered. Three types of equalizers that should be avoided are illustrated in Fig. 4. The one shown as type *A* has the hole too near the top, and would be likely to crack at *D* when under pressure. The one shown at *B* has arms that are too slender at *E*, and would be subject to a springing action when work is clamped. Work which is sprung in clamping, whatever the operation may be, is generally doomed to the scrap heap. The equalizer at *C* has unequal legs, and would respond to a clamping action only unevenly. The old rod-type equalizer is shown in Fig. 5. This equalizer is made up of rods, slabbed off at 45 deg., and working in holes. This type is generally confined to fixtures where weight is not an item, as it requires considerable body to hold and locate the pins. The particular advantage of the rod-type equalizer is that it lends itself readily to locking methods after the equalizing effect has taken place. A locking arrangement is shown on one of the pins in order to convey the idea. One-half of the rod-type equalizer is sometimes used to operate as a

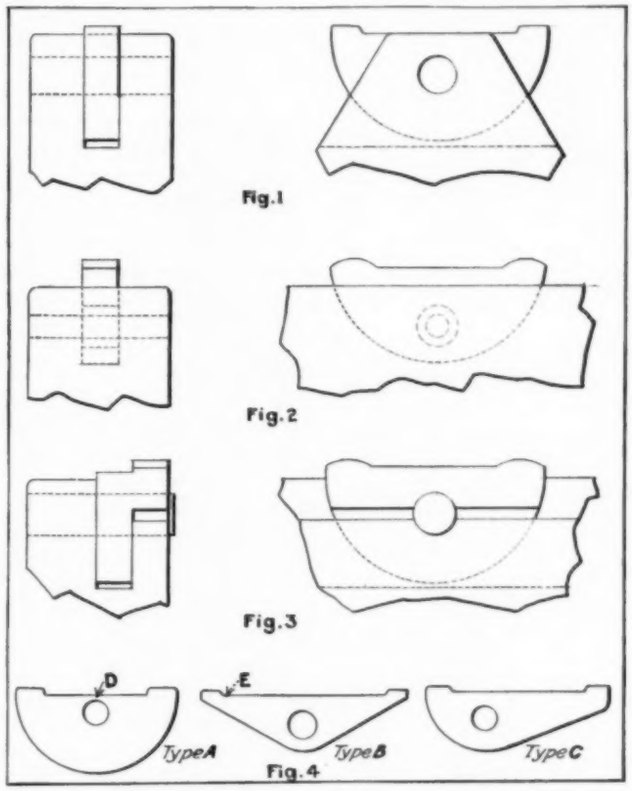


Fig. 1—Simple type of equalizer. Fig. 2-3—Equalizers with solid backing. Fig. 4—Poorly designed equalizers

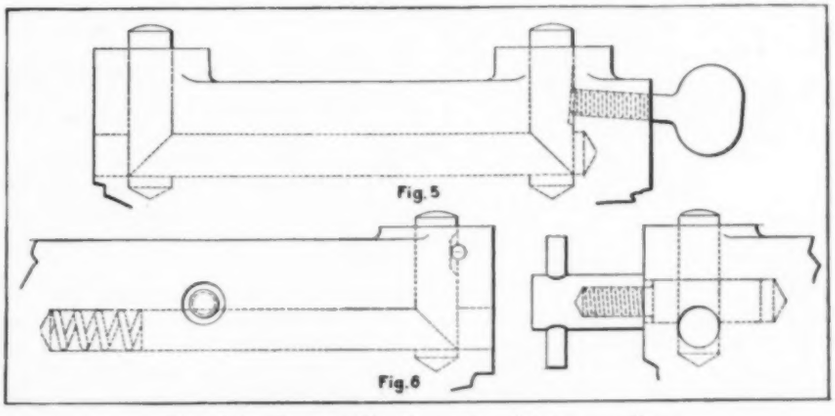


Fig. 5-6—Two applications of rod-type equalizers

spring pin, this being illustrated in Fig. 6. It will operate and bind at a distant point on the fixture, which would otherwise be inconvenient, or which might place the operator's fingers near a revolving cutter.

In Fig. 7 is shown a floating block which acts as an equalizer. The shoulder screws keep the block down, and should be placed as near the equalizing points as possible. The operating screw has a round nose, which engages an inclined *V*. When tightened, the block will float on the nose of the screw, and take up any irregularity of the casting or forging. The screw acting on the inclined plane will hold down the back end of the equalizer.

A variation of the equalizer shown in Fig. 7, but one that is spring actuated, will be found in Fig. 8. This equalizer is held down with a single screw through a slot. The slot in the wall of the fixture at *A* allows a flat spring with two engaging tips to rest against the equalizer, forcing it back against the nose of the screw. The slot in the equalizer allows a forward and rocking movement of the equalizer, yet holds it in position sideways. This type is particularly free from chips, due to the shelf on the equalizer, which guards the spring ends.

A spring pin equipped with an equalizer is illustrated in Fig. 9. The shank of the spring pin should be flattened to keep the arms of the equalizer in relative position to the work, and the spring pin should be locked when the equalizer has reached its operating position. The equalizer in this case will move if any pressure, such as is encountered in drilling or milling, is applied at *A*, therefore another type, shown in Fig. 10, should be used under such conditions.

When one arm of an equalizer has to stand up under a force that is not applied to the other arm, a method of locking must be provided. One arm in the equalizer in Fig. 10 has an elongated radial slot which will allow the equalizer a limited movement. A pull rod with a head passed through the slot has the head resting against the equalizer. When the equalizer is in position, the pull rod can be tightened, forcing one side of the equalizer against the supporting wall and locking by friction.

Another method of holding an equalizer against an uneven thrust is by the use of a spring pin as shown in Fig. 11. One side of the equalizer is slabbed off on the under side to provide a surface for the nose of the spring pin. After the equalizer is in position, the spring pin is brought up and then tightened. This forms a more direct lock than is given by the equalizer in Fig. 10, but care must be taken that the spring for the spring pin is not operated until the part has been clamped into position.

An exception to the equalizer shown at *C*, Fig. 4, clamped unevenly through intention, is illustrated in Fig. 12. The equalizer as shown has legs of approximately 3 to 1 ratio. If this were to be used in a vise jaw on a part similar to the outline, the part would be clamped in place three times as hard at the point *B* where the part is to be milled, as it would at the point *C*, which is to be positioned only. Equalizers will be found useful in many combinations of fixture design, and can be made so that two equalizers will work on a third equalizer to take care of four points.

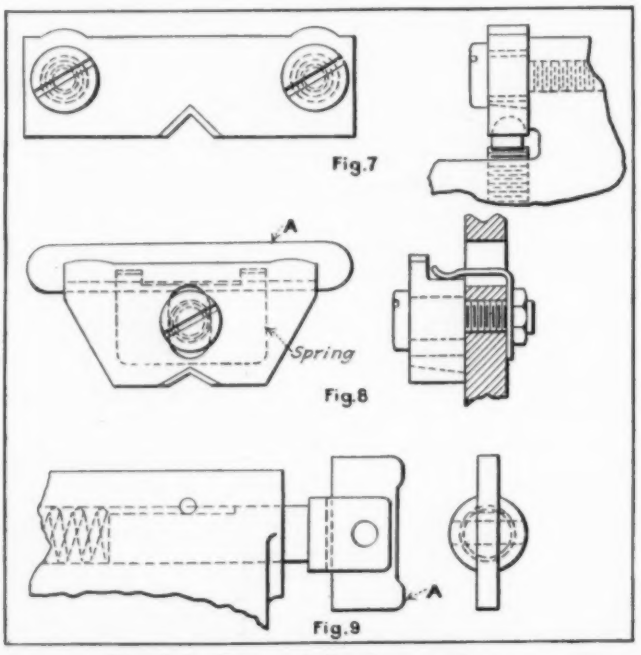


Fig. 7-9—Types of floating equalizers

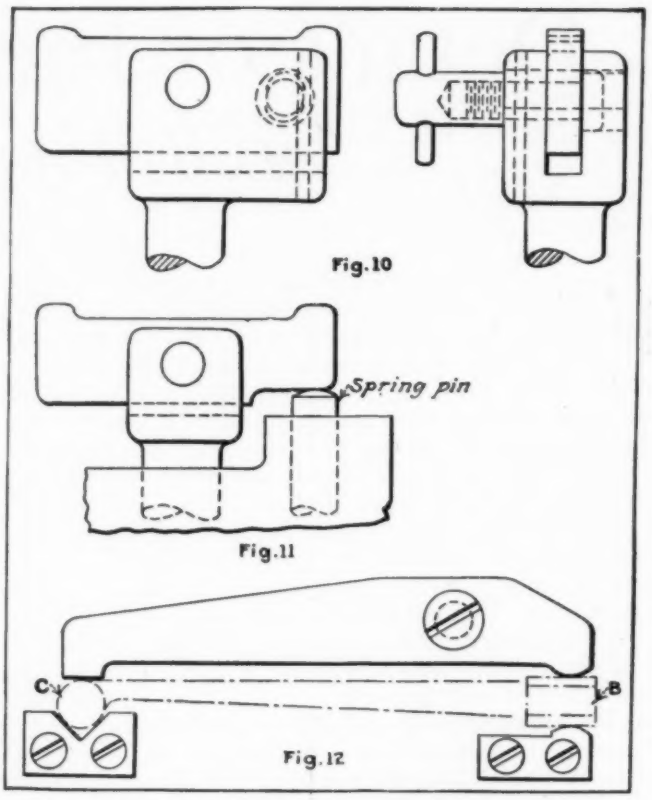


Fig. 10-11—Methods of holding equalizers against uneven thrusts. Fig. 12—An unbalanced equalizer for clamping and positioning

Finish for Patterns

By Wm. D. Bell

WE HAVE found that pyroxylin lacquer is a much more satisfactory finish for wood patterns than the usual shellac. The principal advantages of lacquer are in the fact that it does not raise the grain of the wood appreciably, and that the pattern can be made ready for the sand in much less time than when shellac is used. We find, too, that the lacquered patterns are less affected by moisture, and as a rule produce smoother castings. The lacquer can be applied with a gun or a brush. It has good "covering" properties, and dries hard in a few minutes.

Advantages of Standard Tools for Quantity Production

By M. E. LANGE
Production Engineer, The Warner and Swasey Company

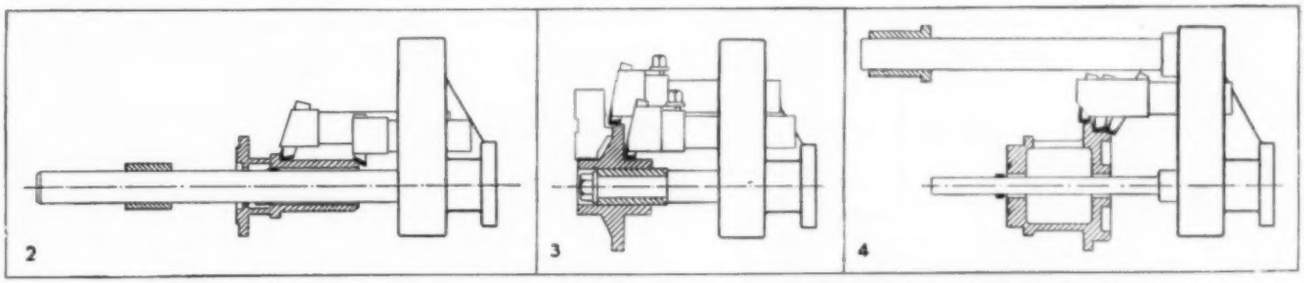
Special tools are made costly by frequent changes in design of products—Standard tools can be adapted to varying conditions and changes, and have longer useful lives

THE keen competition encountered in the marketing of manufactured products requires the straining of every resource to cut the cost of the units produced to the lowest possible amount. This cost is composed of many individual items, and the high-grade, constructive, tool designer cannot overlook the fact that a very definite proportion of the equipment cost must be included in the cost of each individual unit manufactured. He, therefore, is vitally interested in keeping equipment cost at its lowest. The same keen competition just spoken of has also made the market very sensitive, so that it reacts quickly to improvements in the product. Therefore, frequent changes in design have to be dealt with in order to offer a stimulus to the market for increasing sales. Here, too, the modern tool designer must be alert to this possibility, and hence must not lay out his equipment along such rigid lines that such changes would become very costly. This is true even for some of our largest production plants. Special tooling is generally of such a nature that it cannot be used over and over again with changes of design, and hence becomes very costly when frequent changes are encountered. The exact opposite is true with standard tooling, because these tools have been purposely designed for such a large range, such a variety of application, that their universal nature adapts them to varying conditions of manufacture. Hence, in a given instance where the standard tool and the special tool have the same initial cost, the final cost of the standard tool may be only one-tenth of that of the special tool, because of its longer useful life. In order to examine the advantages of the modern standard-tools for quantity production, let us discuss the following four typical tools, studying the wide range of work handled by each tool, and then define when it pays to use standard tools in preference to special tooling: (1) The multiple turning head. (2) Large slide tool. (3) Drill, or tool holder. (4) Small slide tool.

Fig. 1—The multiple-turning head
This head can be used with a variety of standard toolholders, giving rigid support

THE MULTIPLE-TURNING HEAD

The multiple-turning head illustrated in Fig. 1 provides rigid support for the several standard tool holders shown in Figs. 2 to 4. They may be mounted in the several



Figs. 2 to 4—Studies of operations, all of which are met by the use of the multiple-turning head

Fig. 2—The piloted bar gives ample rigidity for turning the cast-iron bearing bracket. Fig. 3—The hole must be concentric with both diameters of the drop-forged hub and the diameters must be held to close limits. Fig. 4—The three cutters in the special, multiple-cutter holder turn two diameters and chamfer the corner of the steel castings

holes of the body, giving any center distance within the working range of the machine. They may also be pushed in or out for long or short work. The following operation studies show three different requirements, all of which are being met with the same head: In the operation on the cast-iron bearing bracket shown in Fig. 2, rigidity is obtained by piloting the boring bar. The work in Fig. 3 is a drop-forging of steel. The hole must be concentric with both diameters and the diameters must be held to close limits. Accurate diameters are made possible by use of standard-angle cutter holders with micrometer adjusting screws to assure quick setting of cutters after grinding, or to compensate for cutter wear between grinds. Concentricity is maintained by the use of a roller pilot, showing the adaptation of a special device to a standard tool.

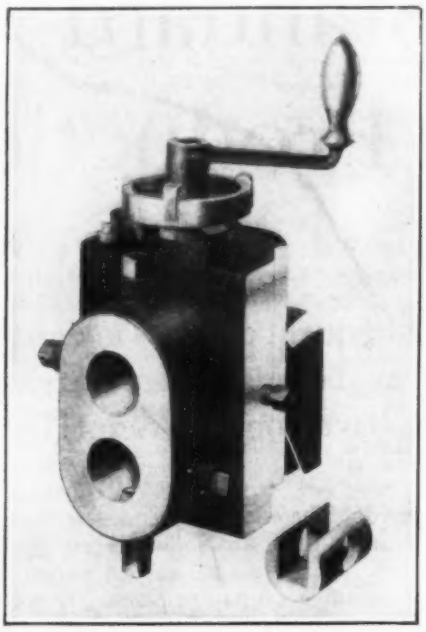


Fig. 5—Large slide tool

The large dial permits easy and accurate setting of the cutter, because the graduations, reading to 0.001 in., are comparatively far apart

The adapter illustrated in Fig. 4 is a steel casting. Three cutters in a special, multiple-cutter holder turn two diameters and chamfer the corner in one operation. The cutters can be quickly reset after grinding, because they fit in individual holes in the holder. This illustration shows the mounting of a special holder on a standard tool. The center pilot-bar is very light and is strong enough to support its own cut only, hence, an overhead pilot-bar was added to secure the rigidity necessary for supporting the three additional cuts. Adjustment of the overhead pilot-bar is possible for machine wear, hence, correct alignment is assured at all times.

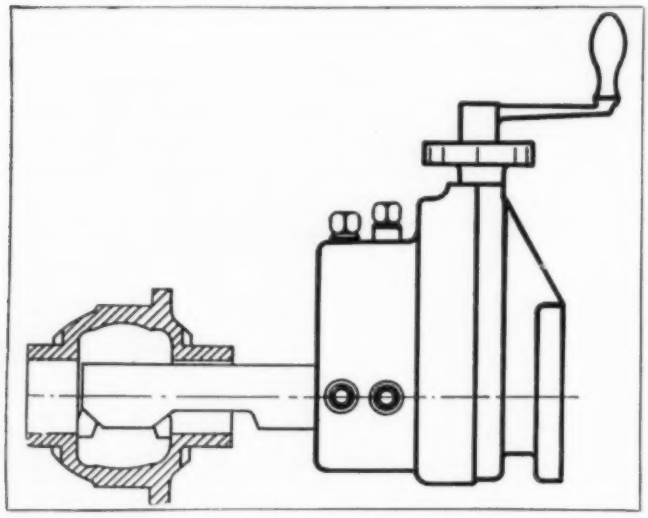


Fig. 6—Machining a malleable-iron differential case

The two cutters in the bar are set by a gage, insuring accurate distance between the inner surfaces. These surfaces have been previously roughed out and are being finished by the bar and cutter held in the slide tool

The Large Slide-Tool

The slide tool illustrated in Fig. 5 is of exceptionally heavy construction. The large dial permits of easy setting, because the 0.001-in. graduations are over $\frac{1}{16}$ in. apart and the metal clips on the dial assure accurate duplication.

In the malleable-iron differential case shown in Fig. 6, an accurate distance is maintained between the two inner faces by setting the two cutters in the bar to a gage. The surfaces have been previously roughed out with a mill-shaped cutter, and the slide tool, as shown, finishes the surfaces. The large micrometer-dial with clips, indicates the beginning and the end of the stroke.

In Fig. 7 an aluminum transmission-case is being machined. The standard slide-tool carrying the bar *A* is of such heavy construction that the back facing and chamfering operations are possible in spite of the great overhang. The use of the slide tool prevents the necessity of making a separate operation of facing the back hub, and automatically assures accurate alignment with the other finished surfaces.

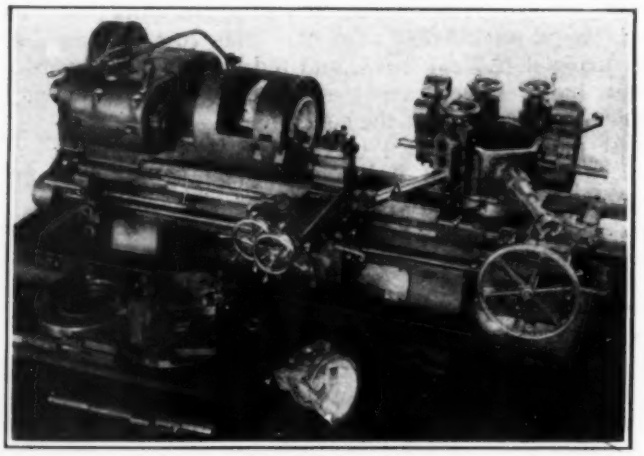


Fig. 7—Turret lathe tooled for machining an aluminum transmission case

Because of the heavy construction of the standard slide-tool, it is possible to back face and chamfer the work in one operation. Accurate alignment with the other finished surfaces is automatically assured

The work in Fig. 8 is a steel casting of a gear blank having a taper hole. The possibility of blow holes in the taper hole made necessary the semi-finishing with a single-point tool, instead of rough reaming from a straight hole, in order to maintain concentricity. The hole is finish reamed.

The standard slide-tool *A*, Fig. 8, has been used, though a spring was substituted for the operating screw, and other minor changes were made, as shown at *B*. Thus, the expense of an entirely special design was saved, and the tool is sufficiently universal to make possible its use for a variety of other taper and irregular-contour work.

The tool shown in Fig. 9 is used for the general mounting of shank cutters, and also to secure sufficient extension for such cutters to reach into deep work, or to prevent interference with cross-slide tools.

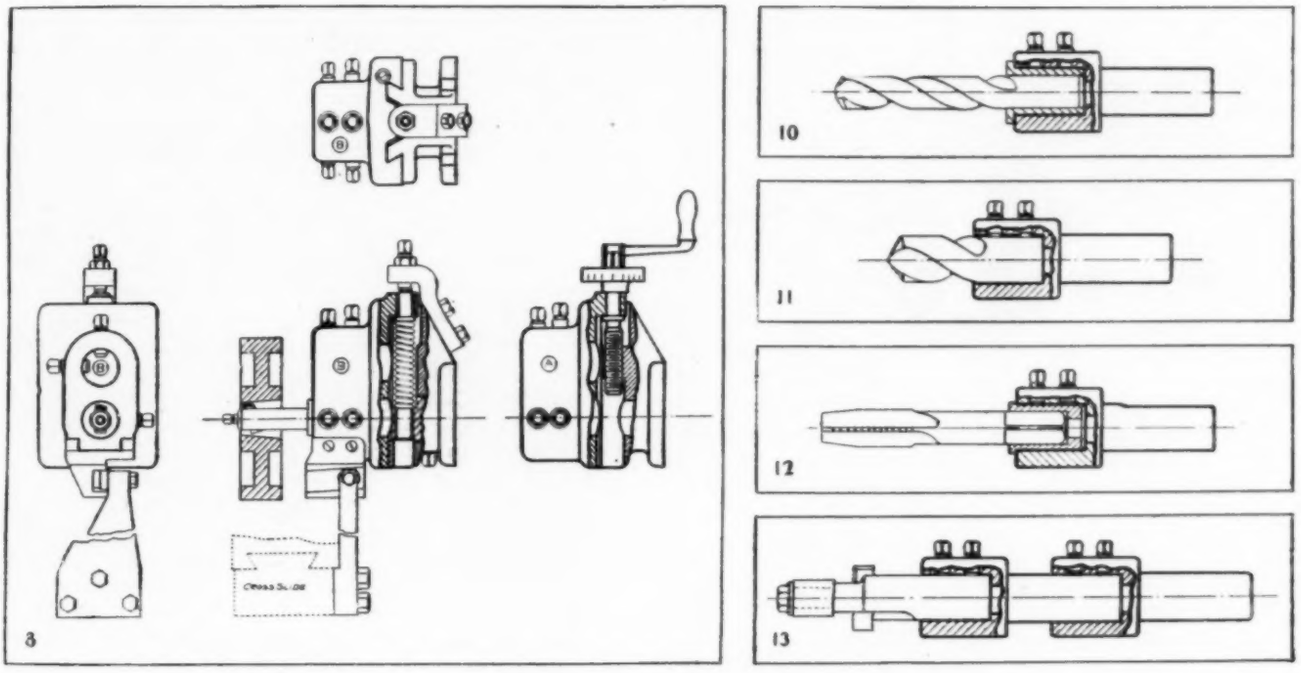


Fig. 8—Set-up for boring a taper hole in a steel casting. Figs. 10 to 13—Methods of mounting small tools to suit various needs

In boring the taper hole in the steel gear, the possibility of blow holes dictated the semi-finishing by a single-point tool. The standard slide-tool has been modified and provided with a taper device. The tool can be used for a variety of taper work. Fig. 10—Mounting for a twist drill, core drill or reamer. Fig. 11—An extension for a counterbore, to save high-speed steel. Fig. 12—Mounting for a square bushing for holding a tap. Fig. 13—Using two drill holders in tandem

The method of mounting a twist drill, core drill or reamer, with a bushing, is shown in Fig. 10, while in Fig. 11 is shown an extension for a counterbore, to save high-speed steel. A mounting for a square bushing for driving a square-shanked, long, tapered tap is illustrated in Fig. 12. In Fig. 13 is shown a method of using two drill holders to provide an extra-long extension. The workpiece was changed in design, making it longer, and this simple tooling-method saved the price of a new counterbore.

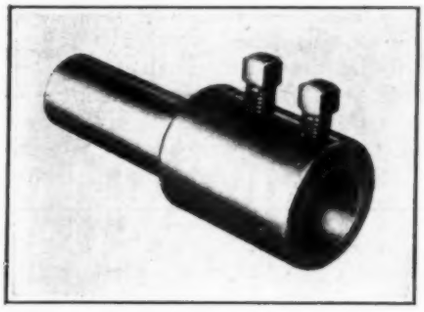
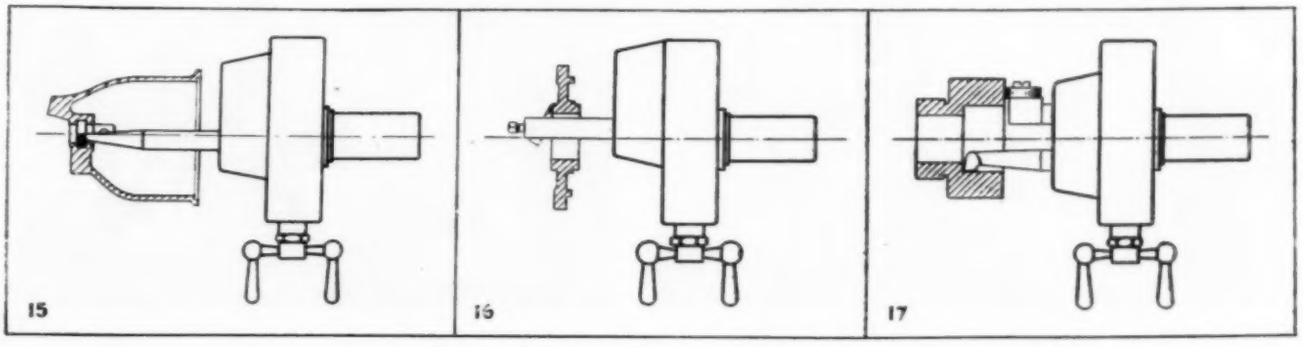


Fig. 9—Tool for the general mounting and extension of shank cutters

The slide tool illustrated in Fig. 14 has a large micrometer-dial and adjustable screw-stops in both directions, so that accurate limits can be held. Some of the uses for this tool are given in Figs. 15 to 17, inclusive. In Fig. 15 the cast-aluminum motor housing for a vacuum sweeper is being grooved for an oil-reservoir chamber before inserting the bronze bushing. The bronze bushing is inserted before the piece is removed from turret lathe. In Fig. 17 the bottom of a counterbore in a forged-steel gear is being faced to accurate depth by mounting a roller stop in the second hole of the slide tool. In Fig. 16 the hub of a bronze end-plate is being back faced. This operation was made possible by a special bar mounted in a standard slide-tool, operating through the comparatively small hole. The back face thereby becomes true with the other machined surfaces,



Figs. 15 to 17—Uses of the standard slide-tool equipped with micrometer dial and adjustable stops

The classes of work shown as examples, are: grooving the aluminum housing for a vacuum-sweeper motor, before inserting the bronze bushing; back facing the hub of a bronze end plate; and facing the bottom of a counterbore, gaging the depth of the cut accurately by a roller stop mounted in the second hole of the standard slide tool

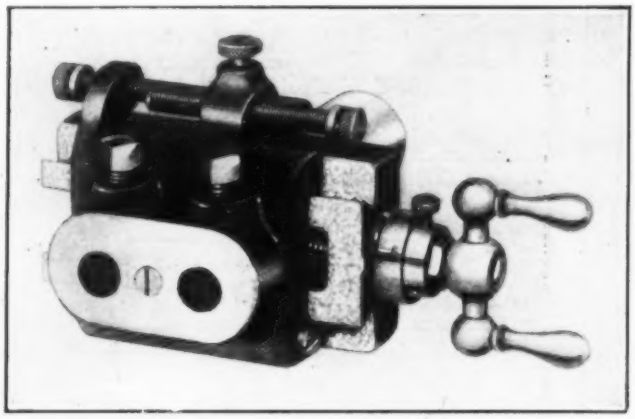


Fig. 14—Slide tool with micrometer dial and screw stops

The screw stops are easily adjusted and can be set to limit the motion in either direction. Examples of some of the uses for this tool are given in Figs. 15 to 17, inclusive

assuring accuracy, and an additional handling is eliminated by doing all the work in one chucking.

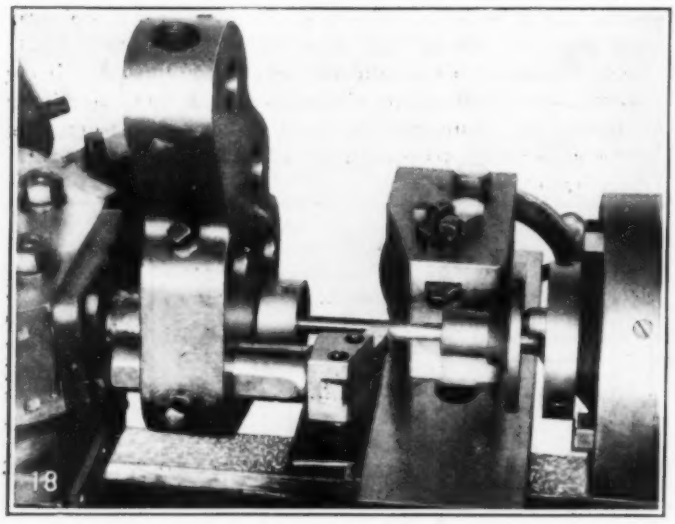
In the foregoing four groups of illustrations, it has been shown that the standard tool has great range for a variety of applications, so that it can be used over and over again when changes of design make a re-tooling job necessary. Hence, the cost of standard tools can be written off over a long period of years, whereas a special tool has to pay for itself in the possibly short life of its usefulness. Let us now see how the standard tool can hold its own in an actual example similar to examples that the tool designer is confronted with constantly.

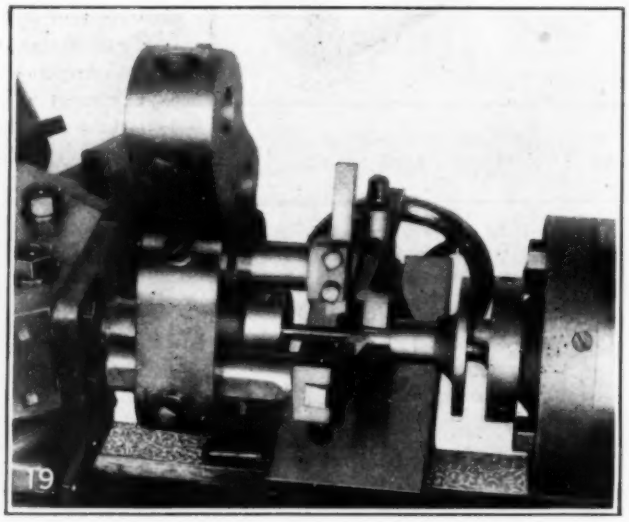
In Fig. 18 is shown the second operation on a flange hub, mounted on an expanding arbor. The end of the hub requires facing, the hub diameter must be turned and the corner be chamfered. In the first place, the taper hole in the work is too small to provide sufficient rigidity for the work-holding arbor without piloting its free end, hence a revolving pilot-bushing is mounted in the standard multiple-turning head.

A special two-cutter block was designed for the cross-slide for facing and chamfering. This procedure was criticized by the shop foreman after the machine had been set up for production. After the first set of cutters had been used up, he changed the set-up to the one shown in Fig. 19, transferring the chamfering operation to the cross-slide where it could be set up at least as easily as from the special block. Further, he made the suggestion that the next machine to be bought for this same work be furnished without the special block, because standard tooling could be furnished for less money. Analyzing this set-up, the following comparison proved that the foreman was right: The cost record showed that the cross-slide block in Fig. 18, cost $55. By substituting the standard toolpost furnished with the machine as standard equipment, and by purchasing the standard, straight cutter-holder for the chamfering cutter and mounting it on the hexagon turret, an expenditure of only $12.25 was necessary. This method showed a direct saving on this tooling job of $55 — $12.25, or $42.75, by using a standard tool instead of a special tool. Furthermore, it was quite evident that this standard tool could be used for a long time, say five years to be conservative, where the special block might have to be scrapped after one year's use. Thus the saving for one year becomes even greater, because the special block at $55 must be compared with only one-fifth the cost of the standard tool. One-fifth of $12.25 = $2.45, which is the actual cost per year on a five-year depreciation basis. It is self-evident that it paid to use the standard tool.

Throughout these paragraphs, no claim has been made that special tools should not be used at all. Special tools will never be entireley done away with, but a proper balance must be established, so that no special tool will be used unless its performance can justify its use on a "dollars and cents" basis. The problem, then, is to determine exactly whether it pays to take each step from standard to special tooling. In order to make this point clear, let us analyze an example of such a case: Fig. 20 shows a job where a wide surface had to be faced, and where a decision had to be reached whether a single, Stellite cutter was to be used for rough facing, or whether a special block with three inserted Stellite bits was to be made to reduce the facing time.

With a single tool, cutting at approximately 90 surface feet and with 0.035-in. feed per revolution, a time





Figs. 18 and 19—Second operation on a flange hub

The flange is mounted on an expanding arbor, and the hub is to be faced, turned and chamfered. The bar is piloted at its free end, because the hole in the work is too small to provide sufficient rigidity for the arbor, therefore, a revolving pilot-bushing is mounted in the multiple turning-head. The special two-cutter block shown in Fig. 18 was designed for facing and chamfering the flange hub. The set-up was changed, as shown in Fig. 19, transferring the chamfering operation to the cross-slide, using a standard toolpost. This change effected a saving of $42 in the tooling cost by using a standard tool

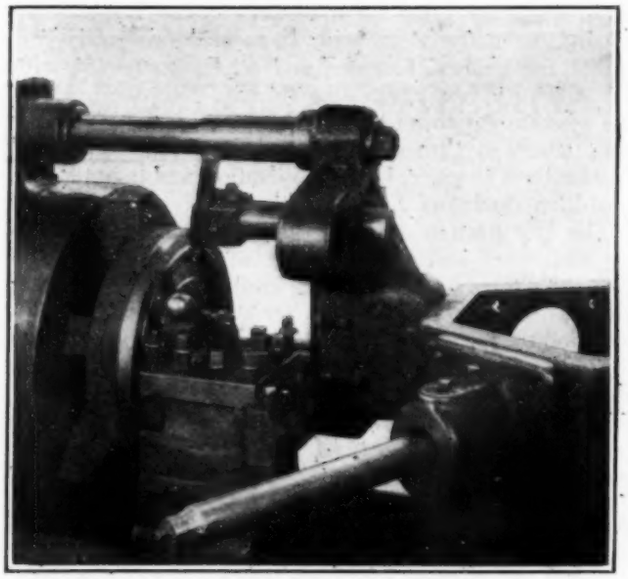


Fig. 20—Machining a wide face with three cutters held in a special block

In tooling for this job, the choice lay between the use of a single Stellite cutter for rough facing, and a special block carrying three inserted Stellite bits. While the special block effected a saving, it required the production of over 2,200 pieces to pay for itself

of 4.18 min. was consumed for the cut. Substituting the special tool, the distance to be traversed was reduced from 6 to 2 in., and the time was reduced from 4.18 to 2 min. With wages at 60c. per hr., we have a charge of 1c. per min. Hence, the cost of this operation with a single tool is

4.18 min. $\times$ 1c. = 4.18c.

Cost with special tool = 2 min. $\times$ 1c. = 2.0c.

Gross profit per piece = 4.18c. — 2.00c. = 2.18c.

Using the triple-cutter block, it took 7.2 min. to complete all the work of this entire chucking. Hence, working on a 48-min. hr. and an 8-hr. day, we have a production of

$$\frac{48 \text{ min.} \times 8}{7.2} = 53.3 \text{ pieces per 8 hr.}$$

Gross profit per day = 53.3 $\times$ 2.18c. = $1.16.

Gross profit per year = $1.16 $\times$ 280 working days = $324.80.

From this profit for the year must be deducted the entire additional tool cost of $50 for the three cutter block, leaving $324.80 less $50, or $274.80 for the net profit.

To the casual inquirer these figures show a saving, but the question that still has to be answered is, whether this saving can be realized before the design of the work will be changed enough to render the tool obsolete, or before the job contract has been completed. A simple calculation will decide this question promptly.

In one case, the cutter holder cost $50 more than the single-point cutter, and the saving per piece was 2.18c. Hence, the extra tool cost cannot be justified until at least

$$\frac{\$50.00 \text{ (additional tool cost)}}{\$0.0218 \text{ (saving per piece)}} = 2{,}247 \text{ pieces have been}$$

made. Thus, it is a simple matter to decide such cases on their merits by a simple calculation in arithmetic.

Naturally, many special tools cannot hold their own on this "dollars and cents" basis, leaving the standard tool as the logical one to be used.

In order to see what proportion of standard and special tooling was actually used on some recent installations, a survey was made of 97 separate chuckings for tooling recently applied to turret lathes. The manufacturers included were exclusively in the extreme quantity-production field, and each installation was a single-purpose unit, constantly being used on the one job only. The tools were grouped into three classes: standard tools; special tools and, lastly, holding devices; standard drills and reamers. The last named group of tools was necessary whether standard or special tools were specified; hence, they were left out of the comparison. Under these conditions it was found that the ratio of standard and special tools was 48.2 and 51.8 per cent, respectively. These cases naturally present the minimum in the percentage of standard tools it is wise to use, and the percentage of standard tools will show an automatic increase as the quantity per lot produced becomes less, approaching more and more the average- and small-lot production field, until finally the entire set-up consists of practically nothing but standard tools.

From all this can be gathered the conclusion that even in the quantity-production field it is good business to use a high proportion of standard tools in all cases, and that no special tools should be used unless they can prove their reason for existence on a "facts and figures" basis.

Teach the Workman to Think

By Russell J. Waldo

SAFETY work, to be made effective regardless of where it is applied, involves teaching the worker to think. This often requires drastic methods of approach. The idea put into all safety signs is to picture to the worker the handicaps that may follow carelessness. Some of these signs have accomplished a considerable amount of good.

The writer noticed in one shop a short time ago a sign securely fastened to the starting lever of a rip saw, reading: "Have you set your guards?" The foreman said he believed that to be the logical place for the sign, as the worker would see it when he reached for the lever to start the machine. He said, further, that there had not been an accident since the sign was put there.

The most effective means of preventing accidents seems to be through pictures that cause the worker to think, and to leave upon his mind impressions which will make him remember in time to come. A picture showing a worker being taken away from a machine seriously injured will have more effect than any other sort of a danger sign that can be put up.

With the modern factory age came the need of greater caution. The strain upon the modern worker's mind due to high-speed production diverts his mind from his work. Quantity should never be placed before safety.

It is possible, however, for a beginner to think too much. Create within him a fear of machines and he is in immediate danger of injury. Better to teach him slowly until he knows the operation of a machine; then start the safety instruction. At first there will be enough to keep him busy, and he will not venture as much as he will later.

After the worker has become accustomed to his machine, it is thinking of other things that causes the majority of accidents.

· BOOK · REVIEWS ·

IRON AND STEEL. By H. M. Boylston, Professor of Metallurgy, Case School of Applied Science. Five hundred seventy-one pages, 6x9 in., cloth board covers, 426 illustrations and 88 tables. Indexed. Published by John Wiley & Sons, Inc., New York. Price $5.

THIS book is primarily intended as an introduction to the metallurgy of iron and steel for the use of students in engineering schools, and for men employed in the steel industry. But because of its practical nature and its concise, progressive exposition of the subject, it should also be a valuable volume for anyone in the machine industries desiring to obtain a better understanding of the raw materials of his business. The extending use of a great variety of alloy steels in machinery of all kinds makes it increasingly necessary for machine designers and builders to have a clear idea of the fundamentals of iron and steel metallurgy.

There are twenty-five chapters to the book, each divided into subject paragraphs for easy reference. The historical and economic background of the iron and steel industry is first taken up, followed by an explanation of the chemical and physical principles, and a description of the raw materials and fuels of the iron industry. Beginning with the blast furnace for pig iron, the various processes of producing iron and steel are described and illustrated. The material is up-to-date, and includes the latest data on electric steel, ingot iron, electrolytic steel, and alloy steels.

FINANCE. By Charles L. Jamison, M. A. Associate Professor of Business Administration, University of Wisconsin. Three hundred and seventy-seven pages, 6x9 in. Illustrated by charts and diagrams. Published by The Ronald Press Company, 15 E. 26th St., New York. Price $4.50.

NOT being an accountant, nor versed in financial matters, the reviewer hesitates to pass on the technical accuracy of this book. But as one interested in finance and anxious to add to his information he found much of value in Mr. Jamison's text.

The author states his purpose as the survey of the finance function of a corporation from the treasurer's desk. His long experience as treasurer of a well known corporation is reflected in what he writes, which is easy reading for the corporation executive, for whom the book was undertaken.

Emphasis is laid on the practical factors of daily routine. Much more space is devoted to the handling of working capital than to the raising of capital from stocks or bonds, because the latter operation must be performed but seldom and is then only carried out with the advice of legal and financial experts.

PROCEEDINGS OF THE INTERNATIONAL RAILWAY FOREMAN'S ASSOCIATION. Two hundred fifty-nine pages, 6x9 in., paper cover. Published by Wm. Hall, Secy., 1061 Wabash St., Winona, Minn.

CONTAINING the proceedings of the twenty-second annual convention of the association, held at Chicago, Sept. 6 to 9, 1927, the volume includes the technical papers read at the various sessions as well as the major discussions that followed each topic. The publication of the material in book form offers a handy reference for general foremen and others connected with the railway industry, enabling them to compare methods and systems employed by other roads with those of their own, which in turn assists in bringing about universal standardized practice, both in operation and maintenance of rolling stock and equipment.

The first portion of the book is devoted to the opening addresses, and to the report of the secretary, and lists the names of the working committees. The topics include: Engine handling at terminals; Terminal Responsibility for car delays; Relation of reclamation to stock reduction; Passenger shop organization; How to obtain the higher standard of equipment maintenance; and determining fitness of employees, which includes treatment of the subject of the selection of men for promotion.

A.S.T.M. STANDARDS, 1927. Part I, Metals. Part II, Non-Metals. Eight hundred seventy-eight pages, and one thousand and six pages, respectively, 6x9 in., cloth boards. Published by the American Society for Testing Materials, 1315 Spruce St., Philadelphia, Pa. Price of each part, cloth $7.50, half-leather $9.00, or $14,000 and $17.00, respectively, for the two parts.

THESE volumes are the regular triennial publications of the society, and contain the standard specifications as adopted. The first part gives the details of 147 separate standards on iron, steel, ferro-alloys, and non-ferrous metals, while the second part contains 196 specifications for such materials as cement, lime, clay products, lubricants, preservative coatings, coal, timber, and insulating materials. Methods of testing are also included, and testing equipment is illustrated.

Before a standard receives the formal approval of the society it is published for one or more years at a tentative standard, in order to give opportunity for revision, if necessary. The standard specifications as published in these volumes are the final approved standards, and are generally recognized as authoritative in the field of engineering materials. A complete list of all standards of the society in effect as of Sept. 1, 1927, is also included at the end of Part II. The two volumes make a useful reference for any plant handling the materials involved.

PROCEEDINGS OF THE THIRTIETH ANNUAL MEETING A.S.T.M. Held at French Lick, Indiana, June 20-24, 1927. Part I, Committee Reports, New and Revised Tentative Standards, 1,142 pages, 6x9 in. Part II, Technical Papers, 564 pages, 6x9 in. Published by the American Society for Testing Materials, 1315 Spruce St., Philadelphia, Pa. Part I contains the annual reports of 48 committees of the society on metals, cement, concrete, building materials, preservative coatings, petroleum products, rubber, coal, insulating materials, textile products, and methods of testing. Eighty-eight new tentative standards and revisions are published for the first time. In Part II is contained the technical papers presented at the meeting, together with the discussions. These papers include the subjects of X-rays in industry, corrosion-fatigue of non-ferrous metals, fatigue testing, wear-testing of metals, and also data on concrete and other building materials. New testing apparatus is also described. The prices per volume are: $6.00 in paper, $6.50 in cloth, and $8.00 in half-leather.

THE · FOREMAN'S · ROUND · TABLE

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Co-operating on Theory and Practice

"WELL, Al, what's the dope on the production conference? How come Williams shot you off to that, anyway?"

"Answering the second question first, Ed, he thought it would be a good thing to have me listen in on what is being done in other places on production work. He's thinking of putting furnaces in the production line and have the hardening of parts done right in the same department where they are made. It will save a lot of expensive transporting, besides giving better control of operations and less stock in process. The conference had a lot to do with heat-treating equipment, and he wanted me to look into it.

"Funny thing, Ed. It isn't the equipment or the production methods that I've been thinking most about, although I learned a lot for such a short time. It was the way the thing was presented. This conference was held by the manufacturers' association of the State in conjunction with the big university at Oldport. Some of the engineering professors delivered papers on the theory and economics of the subject, and then engineers from various companies had papers on what their plants were doing to save money and labor in production heat-treating."

"Weren't the professors a bit 'high horse,' Al?"

"Not a bit, Ed. And I changed my ideas of engineering colleges, too. Guess that's most of what Williams had up his sleeve in letting me go along. Wanted to shake me out of the too practical rut.

"Most of us foremen never saw the inside of a college, you know, and we have the idea that it's where the boss' son goes to play football and learn to drink afternoon tea. But the professors certainly handed us a few mouthfuls about analyzing the situation, and showed some real results of research. Then the practical side loosened up with the frankest kind of discussion of their problems.

"It was a good thing all around. It probably did a whole lot toward keeping the professors in touch with shop problems, but it also taught us a lot about getting out of the rut and taking a bird's eye view of the situation. Just think, Ed, the engineering colleges turn out thousands of young fellows every year who go into manufacturing plants, and there seems to be darn little co-operation toward helping these men to be practical, and making us under-executives realize the value of the other side."

"Were there other foremen there, Al?"

"Quite a number, Ed. And they felt just as I did. We surely got a lot out of our 'one day at college,' and I hope Williams sends you the next time."

What is the value of research to the manufacturer, and where is the foreman's place in interpreting it to the shop? Is there any common meeting ground for the theoretical engineer and the practical man in the plant?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Should the Super Talk to the Men?

I WONDER if Ed can remember some time before he got to be foreman that the super came around and chatted with him a bit? It might have been on a personal or welfare question. Or perhaps the super said: "How's the old boring mill working since we had it overhauled? If it will pull us through this season, we might buy you a new one to run next year."

I am sure Ed would have been delighted to have had an opportunity of expressing his ideas to the super, and if Ed's foreman was so narrow minded as to resent this friendly personal contact of the super with his men, there was something wrong with him. —A. W. FREEMAN.

Calling Down the "Old Man's" Relatives

I WAS the boss' son, and the first thing the boss' son learns is to be skeptical. All hands can be divided into two classes, those diplomatic souls who hope to profit by a kind word passed up the line, and those whose prejudices and enviousness prompt them to throw tact to the wind. The first are bad because they "yes" everything the boy does or says. The latter are bad because it is their nature to be that way.

The redeeming feature of the whole thing is that the boss' son soon finds that he has to depend on himself, that he must not start to do anything that he cannot prove to his own satisfaction before he begins. It makes him study ten times harder than he would if he could depend on a straight-forward answer to his questions. The danger is that he becomes so cynical that unless he has a deep sense of humor, he may become permanently soured. —ENTROPY.

They Set Their Own Rates

OBSERVATION will undoubtedly show that it is not safe to let the men set their own rates in the average shop. However, I do know that Ed was right in his guess for the reason it worked in the "Catlin Plant." Take any man that is on the level, give him an opportunity to prove it, and that method can be used without having it abused. This does not mean, however, that there will not be some who will try to "make a killing," but these are the men to be disposed of.

I heard of a man who was laid off with a poor record from one factory. Another shop hired him, and was surprised at the manner in which he made good. Out of curiosity the superintendent approached him, and asked why he had such a poor record at the other factory. "Well," he replied, "at the other plant they treated me like a fool, and I acted like one. Here you treat me like a man, and I am trying to act like one."

—WALTER W. YEAGER.

THE · NEXT · TOPIC

Shall It Be Layoffs or Short Time?

ADVANCE QUESTION

Al suggests that the men be given a chance to decide whether they work short time or some be laid off. Ed thinks it too much like asking the men to run the shop. What do you think?

WHAT is the idea of having a time-study and rate-setting department if the men are going to set their own rates? What would happen if by some chance the man who figured a certain rate found out he erred, and was not earning enough? Would he have the right to annul his previous low rate, and establish a higher one? The boss might just as well let the shop man pick the easiest job as to let him set his own piece rates.

—SAMUEL KAUFMAN.

The Hidden Costs of Accidents

THE "super" enumerated some of the outside costs of accidents, such as broken tools and machines, the time of the men who must look at every little thing that happens, and of the foreman who helps straighten things out. A few others will be well worth mentioning. A new man must be started at the job, and being unfamiliar with the work, he is not as efficient as the other man. When the other man returns to work he will naturally assume his old job, but during his weeks of idleness he has lost his efficiency, and it will take him time to regain his stride. In addition he will be naturally a little timid for fear that the same thing will happen again.

—E. A. NORDIN.

THE exact cost of accidents is hard to ascertain. There is sometimes a temptation, for example, to allow a man lifting a job with a light cable, to go ahead and make the lift rather than to insist upon his getting a heavier cable. Stopping to get the other cable means tying up the crane, the floor man, his own machine and possibly others. But it is only the thought that if this man should be injured, outside of ill effects to himself, the company will be out the benefit of his services for days, that will make this man stop to get the heavier cable in the first place. —FRANCIS M. MCGEE.

Repairing Locomotive Parts at the Billerica Shops

By Ellsworth Sheldon
New England Editor, American Machinist

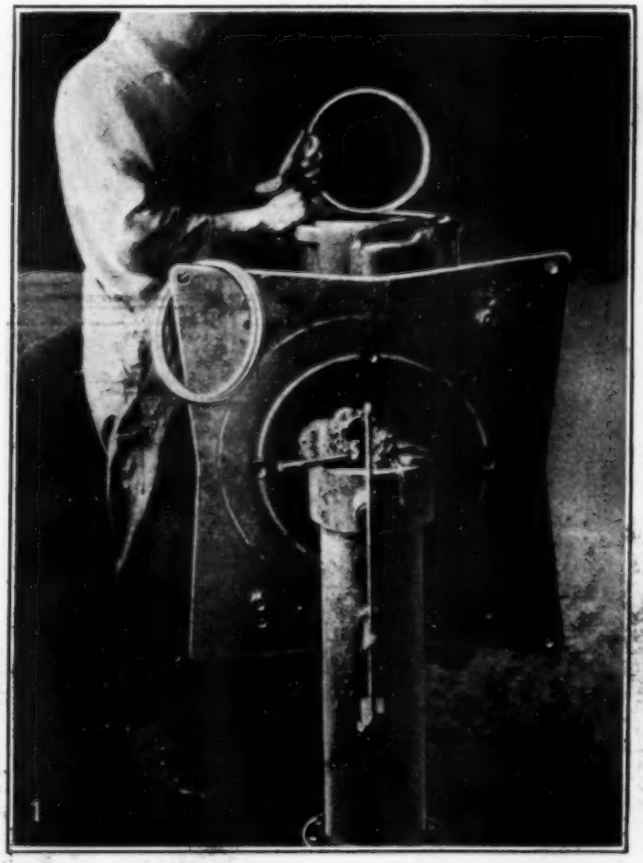
Keeping pace with the increase in size and weight of parts necessary to the functioning of locomotives, special devices are being developed to facilitate the work of repairing

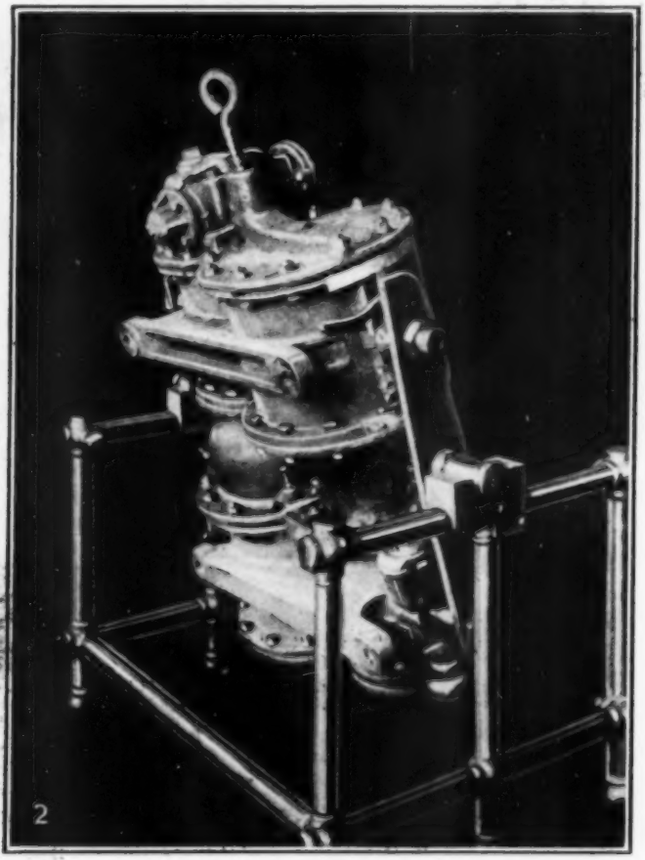
A DEVICE is shown in Fig. 1 on which air-brake pumps, both single and compound, are held while the smaller parts, such as pistons and rods, piston rings, valves, etc., are being assembled. The standard is permanently secured to the floor in a position convenient to the workman's bench, and the rectangular plate to which the frame of the pump is secured swivels about a horizontal axis at its center, so that the pump may be inverted or held at any angle.

A locking pin, actuated by the vertical lever to be seen on the standard, will hold the plate in any one of four positions. In size, the plate is large enough to accommodate a compound pump by bolts through the four holes in the extreme corners. The workman here shown is putting some new snap rings in the steam piston.

Similar stands on which the plate is level and turns about a vertical axis, are employed in the later stages of the progressive assembly. On one of these stands the valves of the pump are adjusted, at which time a flexible hose is used to connect the steam inlet of the pump to the shop air-mains, so that the pump may be run by compressed air until the workman is satisfied that the valves are working properly.

Though compound pumps can be handled on stands such as that shown in Fig. 1, there is a different type of stand, shown in Fig. 2, that is also employed. This stand is made largely of pipe and fittings, and has the advantage that it may be moved about from place to





Figs. 1 and 2—Stands upon which air-brake pumps are assembled. The pumps can be swung to any convenient position. The first one is secured to the floor in a position convenient to the workman's bench. The second one is made from pipe and fittings, and may be moved anywhere about the department at the workman's convenience

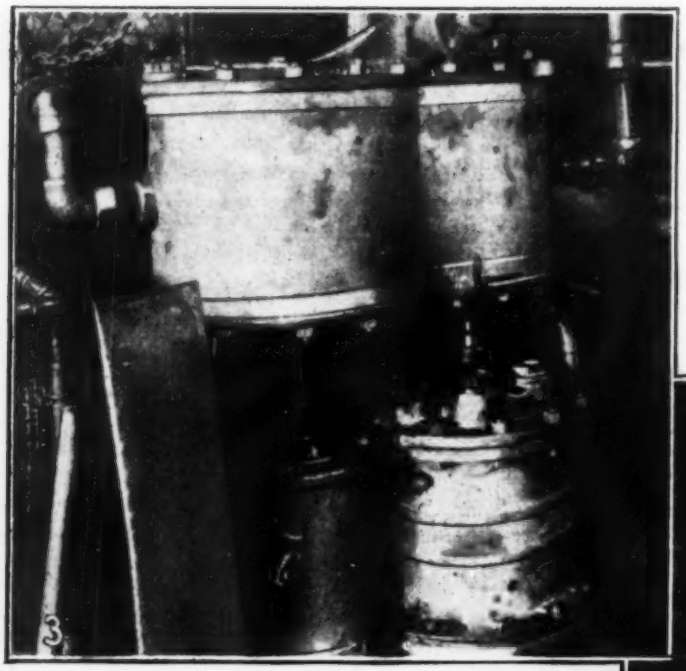


Fig. 3—At one side of the assembling room is a rack to which the pumps may be attached in the same position they will occupy on the locomotive. Steam and air connections are provided so that they may be run under approximately service conditions. With the air ends connected to the pipes, the pumps deliver air against the pressure of the shop mains or to a large receiver in which pressure is maintained at all times for the purpose of testing the automatic valves

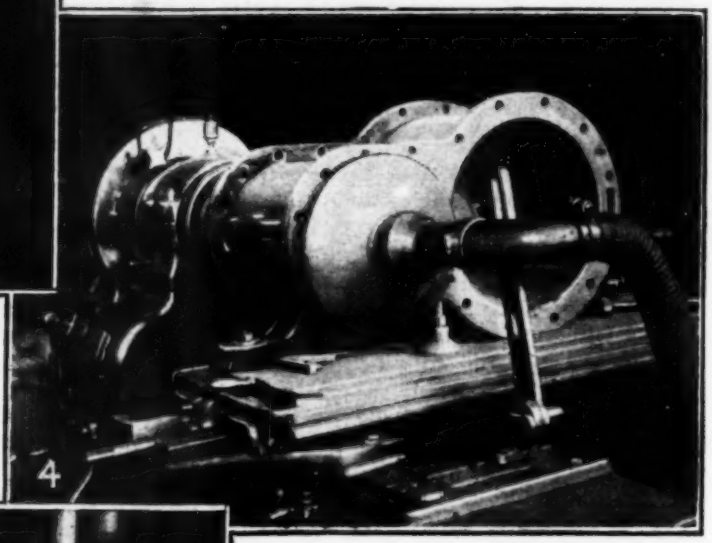


Fig. 4—Cylinders of air pumps are redressed by the grinding process. The steam end of a compound pump may be seen in this illustration

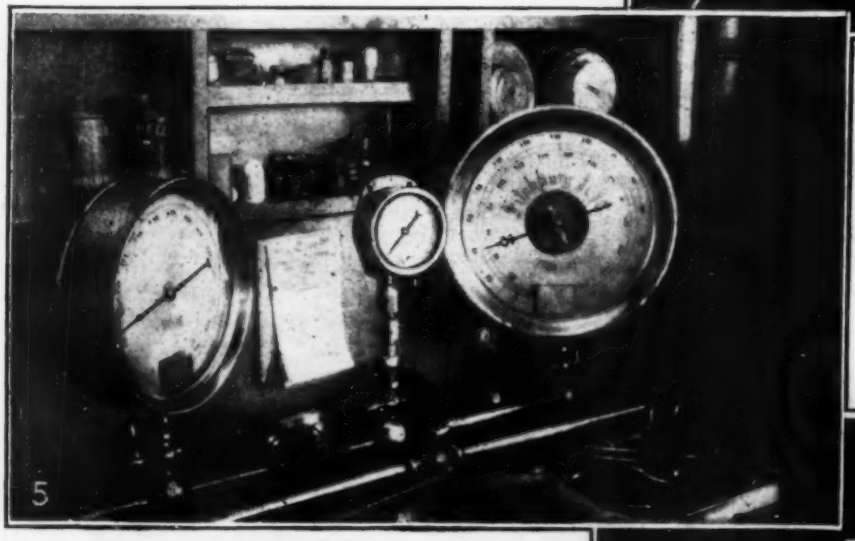


Fig. 5—Where pressure gages for steam, water and air are repaired. Many of these gages are of the duplex type, showing on one dial by means of black and red hands the pressures in the engine receiver and in the train line

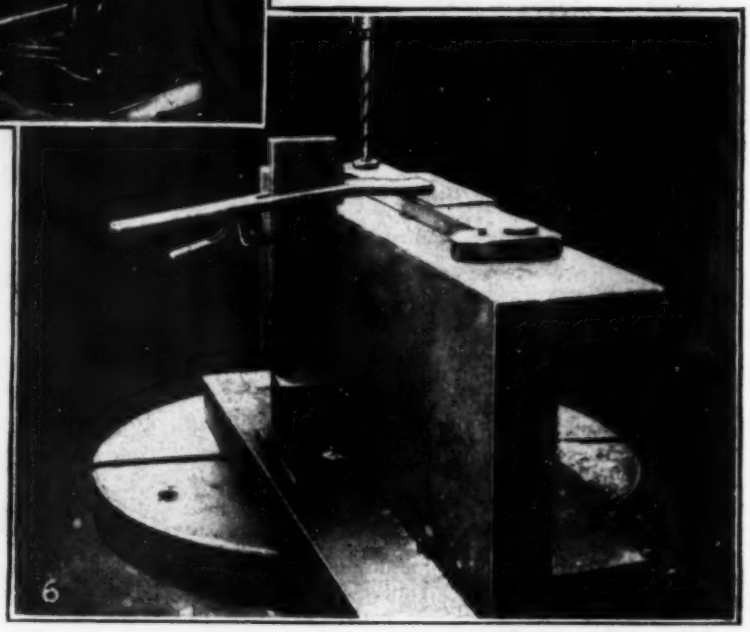


Fig. 6—A jig that enables the man on the shoe-and-wedge job to plane the wearing faces of these important parts to dimension without even seeing the locomotive to which they belong. Holes drilled with this jig locate the shoes and wedges in a planing fixture, on which there is a setting block to set the tool

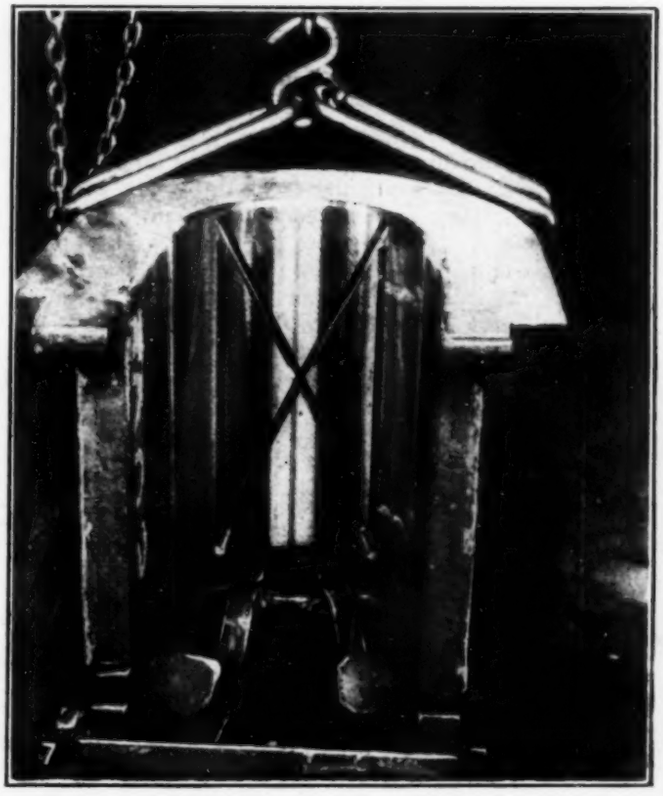
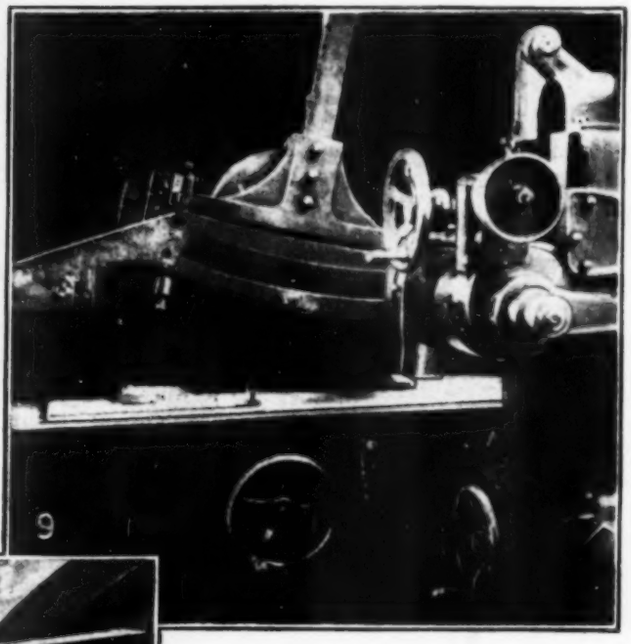


Fig. 7—The Lehmann grooving machine cuts oil channels in crown brasses, straight, circumferential, or at any desired angle, by means of change gears

Fig. 9—Grinding the radius of a Walschaert link. The link to be ground is clamped to a plate at the lower end of the vertical radius bar, and the height of the center-stud about which the bar swings is adjusted to correspond with the desired radius of the link.



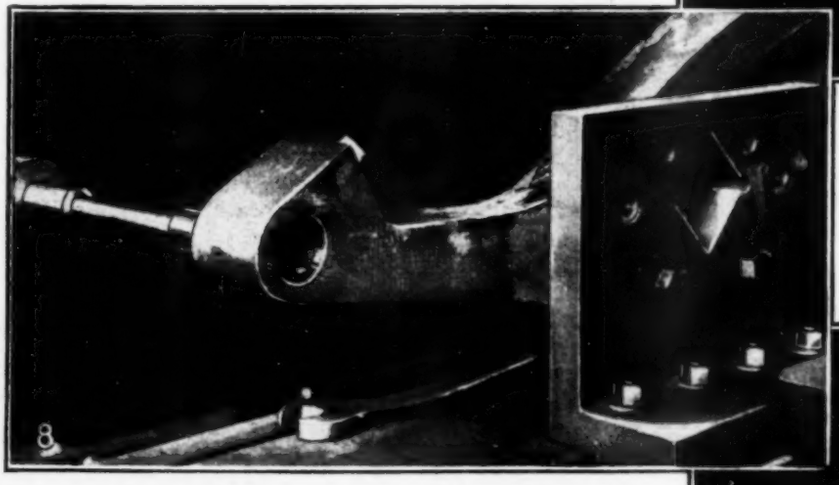
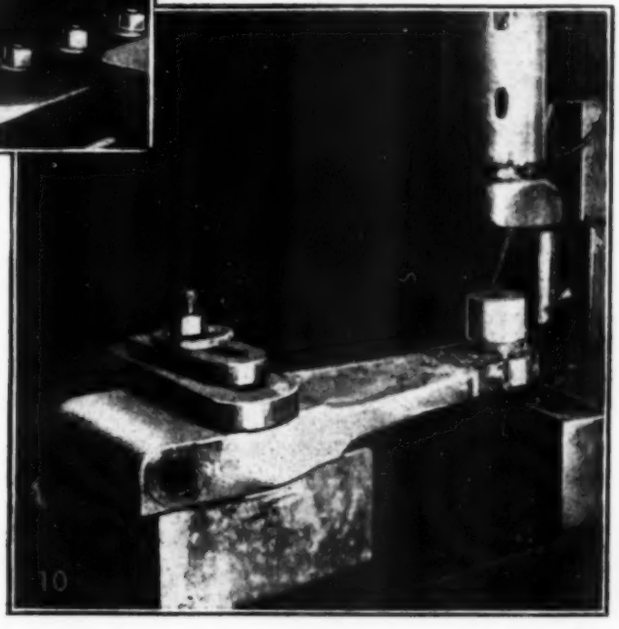


Fig. 10—This would be an awkward job to do in a lathe, but the pin is easily turned by means of an offset tool held in a boring machine

Fig. 8—The use of heat-treated alloy steels, in place of cast iron or mild steel, as materials from which to make the wearing parts of the Walschaert and other valve motions of locomotives, necessitates the employment of the grinding wheel as a means of machining or redressing them. Here may be seen a Walschaert link, mounted upon a cylinder grinding machine of the planetary type to grind the round hole in the end of the link to fit the pin that connects the link to its actuating rod



place at the convenience of the workman. The method of holding the pump by means of separate trunnions bolted to the frame is to be seen in the illustration.

At one side of the room is a rack, made of structural steel and long enough to hold several pumps, to which each pump is bolted after the assembler is satisfied with its action under compressed air while on the stand. On this rack the pumps are run for several hours under steam, and deliver their air against the pressure of the shop air-mains, or to a receiver used in connection with the testing of other parts of the brake mechanism. Fig. 3 shows a pump on the rack and running under what amounts to service conditions.

Overhauling a pump usually includes redressing the cylinder bores, and this is done by grinding. The steam end of a compound pump may be seen in Fig. 4 on the table of a cylinder grinding machine of the planetary type. This machine is located adjacent to the assembly floor and is served by the same electric hoists that handle the heavy parts throughout the assembly. Since the pump frame itself furnishes a ready means of aligning on and attaching to the machine, little time is required to make the set-up.

In the same department where the pumps are overhauled, all of the auxiliary mechanisms of the air-brake system are reconditioned and tested. There is a sufficient number of the various parts—engineer's valves, triple valves, etc.—constantly under repair to keep one or more men employed on each, so that the men become experts upon their particular parts. In Fig. 5 may be seen the section where all pressure gages—steam, air and duplex—are repaired. Since all of the parts of the air-brake system, aside from the pumps, are small and the operations are conducted by hand with files, scrapers, lapping plates and similar tools, illustrations would not show them to advantage.

Turning from the air-brake department to parts of the locomotive itself we may see in Fig. 6 the device that enables the planer operator on the shoe and wedge job to plane these important parts to the right dimensions the first time without having to hunt up the engine to which they belong.

When the center-distances are laid off on the engine under repair, each yoke, or jaw, of the frame is fitted with a shoe and a wedge upon which all of the machine work has been done except to plane the faces that are to bear against the driving box. The layout man, having gotten his center distances to his satisfaction, makes a couple of deep prick-punch marks upon the side of each shoe and wedge, stamps each with the number of the engine and with another symbol—as R-1, R-2, L-3, etc.—to designate its position in the frame, and sends the set to the machine department to be planed upon the driving-box faces.

The device shown in Fig. 6 is a jig that is located on the shoe or wedge by two sharp center-points fitting into the prick-punch marks before mentioned. The jig is clamped in this position by the ratchet-controlled hand lever of the device while two small blind holes are drilled into the side of the shoe or wedge through the drill bushings of the jig.

When the drilled casting is placed in a fixture on the planer it is located from these blind holes. The point of the planer tool is then set to a locating point or surface on the fixture and the surface of the shoe or wedge is planed. The operator does not even have to see the engine to which the parts belong.

Cutting oil channels in crown brasses by means of chisel and hammer used to consume a deal of time and require no small degree of skill. The channels shown in Fig. 7 were cut on a Lehmann grooving machine in less than 15 min. By means of the two straight feeds of the machine, the channels may be cut either parallel or circumferentially with relation to the axis of the journal, or by combining the feeds through a train of change gears, they may be disposed at any angle, as here shown.

With rising boiler pressures and increasing size and weight of the valves of locomotives, cast iron and mild steel have given way to heat-treated alloy steels as material from which to make the parts of valve motions that are subjected to wear, and the only tool with which such material may be worked satisfactorily is the grinding wheel. In Fig. 8 may be seen the wheel of a planetary grinding machine at work upon the pin hole of a Walschaert link, and in Fig. 9 the radius of the link itself is being ground.

To turn the pin of a return crank—that part from which the valve derives its primary motion through the Walschaert type of gear—would require a lathe of large swing in order to turn a very small diameter, if a lathe were to be used for the purpose. Instead, a rotating, offset tool is used in the spindle of any boring machine of sufficient rigidity, while the crank is secured as in Fig. 10 on the table of the machine.

Aviation Needs in 1928

AVIATION is growing more rapidly than those who are not even indirectly connected with it, realize or appreciate. Without going into the number of planes in daily service, which now number in the thousands, the total number doubled in 1927 and bids fair to double again in 1928. Nearly all of this increase is in commercial aviation. One concern that supplies airplane accessories reports that governmental orders now form only one-third of the total demand as against seven-eighths a few years ago. This is one of the best signs of the growth of commercial air travel.

Engines are the main problem at present, there being but few sources of supply and the cost is high. There are, however, new developments under way and engines for small planes are likely to be available by the time the present supply is exhausted. One of the well known builders is to bring out a line of motors of smaller horsepowers, for two and three-place planes. Another large shop that is well equipped for high grade work is also at work on an aviation engine and expects to be in production during the year. It is also well known that the Ford organization has built a number of airplane engines, one of the small, two-cylinder opposed type being used in the recent attempted non-stop flight of the Ford "flivver" plane from Detroit to Miami. Just when these engines will be available is not certain, but it is not at all likely that the need for engines will long remain unfilled.

Air travel is growing as rapidly as is healthy at this time. And the increasing use of metal promises to make a new field for machinery of various kinds.

Giving rewards for suggestions is an old plan, but one not worn out by any means. And a $500 suggestion shouldn't receive any measly five-dollar reward.

Listen to all the advice the other fellow has to offer but use your own judgment in making decisions.

Depreciation and New Machine Equipment in the Johnson Shop

By John R. Godfrey

IT LOOKS as though Old Man Johnson was getting several sizable jolts on business methods from his son Tom. First Tom read him the riot act for not putting the amount charged off for depreciation in a reserve fund for new equipment. Now, he is continuing his education as to new machines paying for themselves—and how soon.

"Got a new slant on profits from machine tools the other day, dad."

"More new notions, son? Won't be any living with you soon. I haven't quite got over being shown up as a misappropriator of funds yet. That machine reserve business you were talking about the other day, Tom."

"More notions, dad—and good ones too, I believe. Sat in on an S.A.E. meeting in Cleveland a while ago and heard George Trundle tell the automobile men they were all wet when it came to figuring that a new machine should repay its whole cost in a year. And when you come to think of it, dad, demanding a hundred per cent investment is laying it on a bit thick. I remember how you've often said that the man who designed and built a special machine that saved you a lot of money, usually came out the little end of the horn."

"Well, shoot the new idea, son. I'm getting prepared for most anything since the last wallop."

"It sort of ties up with the other idea too, dad. Sort of a continued story, like. Trundle figures that the real net cost of the new machine isn't as much as it seems at first glance. The money you're supposed to have tucked away in gilt-edged bonds was laid aside toward a new machine to replace the old one. So the new machine doesn't really cost you its full price, but only the difference between its price and the depreciation you've charged off on the books. Then, too, the scrap value or the resale value of the machine (if it has any) should come off the cost of the new machine."

"Looks like juggling figures to me, Tom!"

"Not a bit, dad. Say your old machine cost two thousand dollars and you've charged off two hundred a year for five years. That thousand dollars belongs to the productive equipment end of the business. You've charged it off to buy new equipment with. And when you buy the new machine you use that money, plus the scrap value of the machine you replace, to help pay for it. So the new machine only foots up the difference to your real equipment investment."

"Sounds easy, Tom, but suppose you've had to use the money for something else?"

"Then don't kid yourself into thinking you've been making a profit, dad, 'cause you haven't. Just get it fixed in your mind that low-cost production means the best machine equipment. No guess work about it dad, it's the first law of manufacturing. If we don't provide for actually buying new equipment when we need it, we're handicapping the production end of the game—'Killing the goose that lays the golden egg.' "

"But I thought we were talking about reckoning the real cost of new machines, Tom?"

"So we are, dad. I just wanted to impress you with the fact that we've simply got to keep our equipment modern to stay near the head of the procession. I'm trying to wipe out part of the apparent cost by showing you that we've no business to charge the whole cost on new machines, but only that part that exceeds the depreciation and salvage value of the old one."

"Then what, Tom?"

"Then, dad, it's only fair to ask the new machine to earn its keep on the real cost—not its full price. If it can show a substantial saving on that figure—it's a good buy—even if there are not other reasons."

"Such as—Tom?"

"Such as greater accuracy that will help in assembling—such as less floor space—fewer breakdowns—and less upkeep—and a dozen other reasons."

"Looks like you might be right at that, Tom. Guess we'll have to watch our bookkeeping and be sure we don't use the depreciation we charge off for anything but new equipment. You're an impulsive bird, Tom, but you do dig up a real idea once in a while."

It isn't every old man who accepts new ideas.

Taking Chances—*Discussion*

By H. Maplethorpe
West Bromwich, England

IN AN article under the title given above, published on page 607, Vol. 67, of the *American Machinist*, Charles Homewood scouts at the idea of workmen being able to make close measurements with the ordinary inside calipers, after transfiguring the dimensions from a micrometer.

I would like to remind Mr. Homewood that measuring with calipers to within from 0.005 to 0.0002 in. is a matter of touch and experience, and that some mechanics have a much more sensitive touch than others. I have a mechanic who, when turning a long shaft, will turn the first six inches to the micrometer and then set his calipers to that part. Using calipers alone for the balance, he will turn a 30-ft. shaft and the variation from size will be less than 0.001 in. He can turn a shaft much quicker when using calipers because he tests the size while the lathe is running, whereas in using the micrometer it is necessary to stop the lathe each time a test is made, and when a lathe is stopped under cut, there will be a variation in the size of the work after it has been started again.

Calipers that give the most accurate measurements are the ones that have been in use for a long time. The points are worn round and smooth, and respond to a very light touch. Accurate sizing with calipers requires skill, backed up with long practice and common sense. Long bores can be gaged more accurately with calipers than is possible with an inside micrometer, both for roundness and parallelism. The touch is more sensitive with the calipers than with the micrometer, and the micrometer cannot be handled in a hole with the same ease as calipers.

IDEAS · FROM · PRACTICAL · MEN

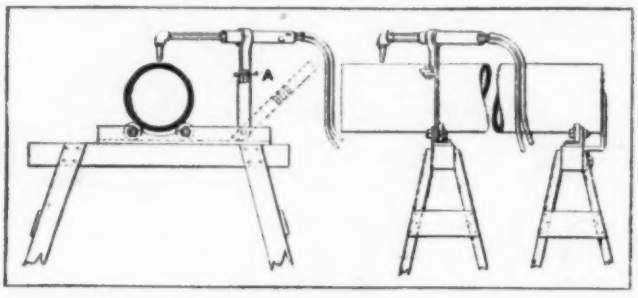
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

Cutting Pipe With an Oxyacetylene Torch

By N. M. Sorensen

Some time ago, we had to cut off several hundred pieces of double extra-heavy pipe of diameters varying from 4 to 7 in. The pieces cut off had to be fairly accurate in length as they were required to be faced to a given dimension.

We decided to do the cutting with an oxyacetylene torch, using the improvised rigging shown in the illustration. The pipe was mounted on trestles and revolved on four discarded ball bearings, two on each trestle, and could be revolved easily by one hand. The torch was



Rig for cutting pipe with oxyacetylene torch

mounted as shown, the swivel joint *A* being placed in the mounting for ease of adjustment. When moving the trestle for a new cut, the torch was swung back, as shown by the dotted lines.

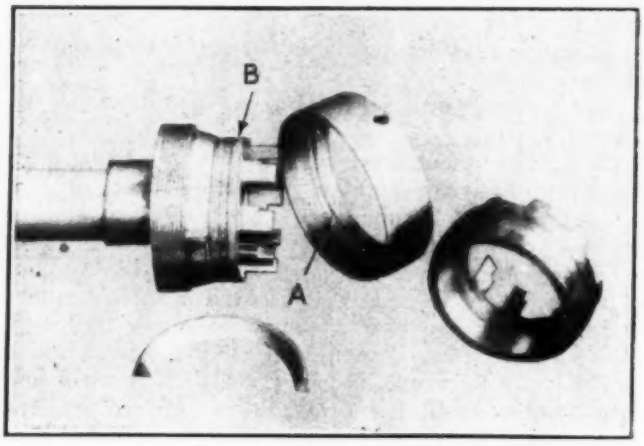
An end stop was provided to keep the pipe in position during the cut. However, we found that in revolving the pipe, it had a tendency to creep away from the stop, but we got over this by moving the trestles slightly out of parallel.

Holding Fixture for Milling a Clutch Shell

By O. S. Marshall

Effective milling operations depend largely on adequate holding methods. A case in hand is a shell clutch, in the end of which is a 15-deg. taper, both inside and outside for ⅝-in., the balance of the hole being straight. One of the clutches is shown at the right in the illustration, also another one in position on part of the holding device. The threaded portion immediately back of the clutch belongs to the stud for holding the clutch during the milling operation, and is screwed to the end of a regular taper arbor fitting the dividing-head spindle.

A bevel ring, cut in half, is made to fit the taper of



Holding fixture for milling a clutch shell

the clutch shell, one-half of this ring being shown in position on the clutch, while the other half is shown by itself. A threaded cap, shown between the two clutch blanks, has a shoulder *A* that engages the bevel ring, and when the cap is screwed onto the supporting stud, the shoulder *A* forces the bevel ring against the taper face of the clutch until it has a rigid contact against a shoulder on the supporting stud. There is a narrow shoulder *B* on the clutch, which necessitates splitting the bevel ring to get it in place.

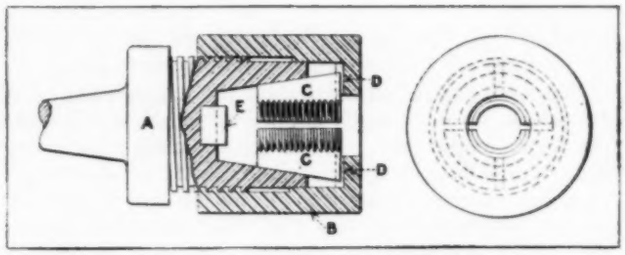
The clutch held in this manner permits rapid milling operations, while preserving it in perfect shape after it has been machined.

Driver for Large Studs—*Discussion*

By R. G. Hewitt
Yorkshire, England

The only feature of the stud driver described by James Pritchard on page 591, Vol. 67, of the *American Machinist*, is that when the spindle is reversed, pressure is released from the stud and the driver is unscrewed without further resistance than the friction between the threads. However, Mr. Pritchard says that "Should the stud and the nut seize, due to being too tight a fit or to inequality of the pitch, the screws *H* can be backed out leaving the halves of the nut free for removal." In such a case the machine must be stopped, which in my opinion is the chief drawback of the driver. Also, the stress set up by the end thrust will tend to distort the threads.

A stud driver that will overcome these difficulties is shown in the illustration. The shank *A* has a square, two-start thread on which is screwed the cap *B*. The two threaded-segments *C* are tapered on the outer diameter to suit the taper hole in the shank, and are grooved at *D* to engage with keys in the cap. The brass piece *E*



A stud driver that will not seize

is a snug fit in the recess in the shank, and must project into the taper hole an exact distance for the proper functioning of the tool.

In operation, the stud is started in place by hand. Then the machine spindle is lowered, bringing the driver over the stud. When the driver engages the threads on the stud, the friction set up causes the cap to slow down and move along the thread on the shank. This action forces the threaded segments inwardly, thus gripping the stud evenly. As the movement continues, the end of the stud finally brings up against the brass piece *E*. At this time the inner end of the cap is against the shoulder of the shank and the stud is being firmly gripped by the threaded segments. Thus the end stress is evenly distributed on the threads and prevents their distortion.

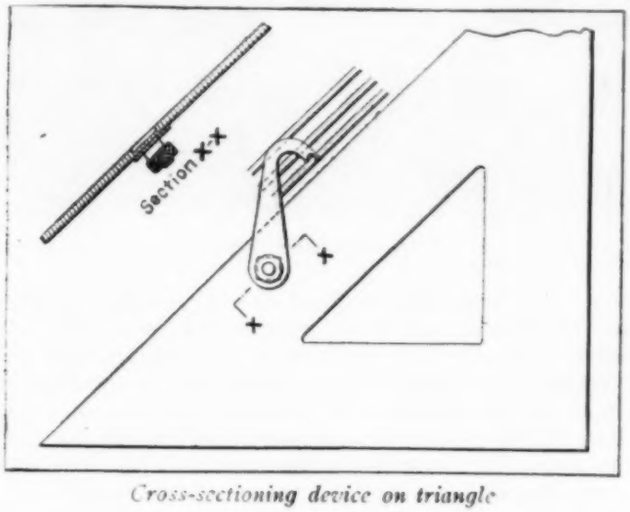
When the machine spindle is reversed, the grip on the stud is released. All risk of seizure is eliminated because the first action is the unscrewing of the threaded shank from the cap, thus releasing the grip of the threaded segments from the stud.

Cross-Sectioning Attachment for a Triangle

By C. G. Macfarquer

The illustration shows how an ordinary draftsman's triangle can be converted into a tool for cross-sectioning. The economy of its construction is obvious.

A finger is attached to the triangle and its pointer end is bent down so that it just clears the drawing paper. As shown, the device is being used for sectioning for steel,



Cross-sectioning device on triangle

but can be used for sectioning cast iron by using one of the two points only. The screw for attaching the finger should have a shallow head and the head should be let in the triangle so that its end does not project.

Grinding an Angular Surface with a Portable Tool

By J. Madden

How the finishing of the angular face of dryer-head manholes by grinding is accomplished in the plant of the Dominion Engineering Works, Ltd., Montreal, Canada, is shown in the accompanying illustrations. The portable

Fig. 1—Portable grinding device for finishing angular surface applied to a dryer head

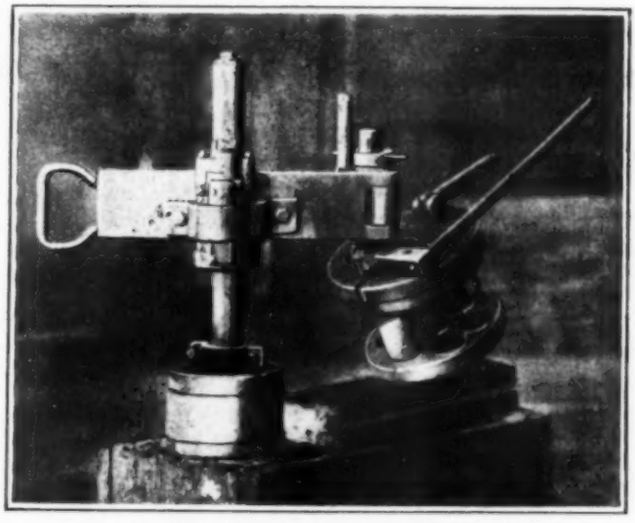


Fig. 2—The grinding device detached

grinder and its holding fixture, applied to the head, are shown in Fig. 1. In Fig. 2 the guide and fixture are shown detached from the dryer-head.

A "Rotor air tool" does the grinding. It is carried on an elbow arm, adjustable vertically on a stud that itself is adjustable angularly and which may be locked

in position. The stud is connected to a mandrel that fits the journal bore of the drier.

Clamps are provided to tighten the mandrel in the bore and to clamp the stud once the position of the pneumatic tool, with the grinding wheel parallel to the face of the manhole opening, has been obtained. Threaded collars on the stud control the feed of the wheel, or depth of cut.

Spacer for Section Lining
Discussion

By Henry Simon
Jena, Germany

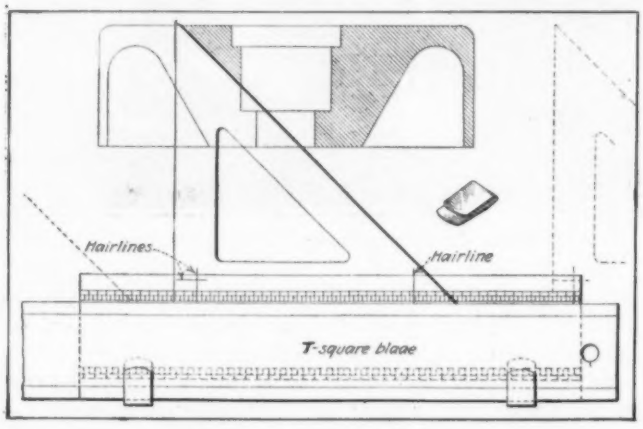
In an article under the title given above, on page 665, Vol. 67, of the *American Machinist*, the arguments presented by Frank D. Smith, Jr., in favor of spacing in some way other than by eye are entirely sound, and the scheme described by him is servicable. I formerly used the same plan but discarded it in favor of the arrangement shown in the illustration, which I think is much superior.

A strip of bristol board on which two double scales, giving four spacings, have been accurately drawn, and about $\frac{3}{4}$ in. wider than the blade of the T-square, is held in position on the blade by means of two clips bent up from about 0.010-in. spring bronze or brass. As in the arrangement described by Mr. Smith, the scale is used in conjunction with a celluloid triangle on which, however, fine hairlines have been drawn, as shown. By this plan, the lateral range obtainable without shifting the scale is increased, and the general convenience of working is bettered. In the arrangement used by me, the bristol board scale is 15 in. long and the short sides of the triangle are 12 in. long, with two hairlines 10 in. apart. This arrangement gives a working length, without resetting the scale, of almost three feet.

The plan of blackening the hairlines of the triangle with ink, as proposed by Mr. Smith, is not the best. Very black and sharp lines can easily be produced by drawing the lines very lightly with a very sharp needle point and then rubbing lamp black over the slightly moistened area with a bit of soft rag.

By giving the scale a coat of thin shellac it can be made to last indefinitely, or a fully permanent device may be made from ivory celluloid, with the divisions scratched in and blackened. It should be noted that the lower leg of each clip is flat and longer than the upper one, which is slightly curled up at the point. Made in this way, the clips can easily be slipped on, yet permit the T-square blade to lie entirely flat on the board.

This device costs no more than the expenditure of 30 min. work. It is instantly slipped on or off and is therefore never in the way. It has the advantages of a scale fixed so that it cannot accidentally shift; of always giving a full footing of the triangle on the T-square blade; and of far better visibility and therefore lessened eyestrain. In consequence, much more rapid as well as better work is possible.

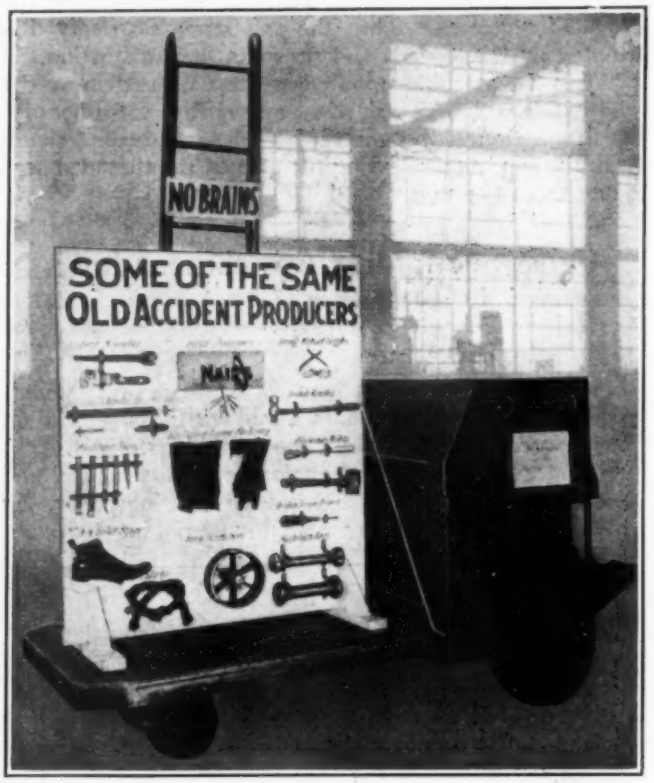


Spacer for section lining

A Safety Side-Show

By J. S. Browne

Bringing the side-show idea to the shop was practiced with good effect at the plant of the Westinghouse Electric and Manufacturing Company during a recent "safety month" drive. The accompanying illustration shows a bill-board exhibit of tools and equipment which had caused accidents in the shops. The exhibits were labeled on the board, and included bent wrenches and mushroomed tools that had caused smashed fingers, thin-



A traveling safety exhibit

soled shoes that had resulted in cut and burned feet, broken handles, torn clothing, weak sling ropes, a broken ladder, and a broken truck wheel, or "ankle scratcher." The board was brought from department to department on an electric truck for exhibit, and some nascent P. T. Barnum on the safety engineer's staff added the sign "no brains" to indicate that the management was not in sympathy with saving time or money by using equipment that had reached beyond its period of safe usefulness.

Aluminum founders are using "chill plates" in the mold on surfaces that require a very close grain when finished.

Notes on Bearing Babbitts

Experience has shown that a homogeneous metal is not best for bearings. A good bearing metal is an alloy composed of two or more metals, or a metallic compound that will separate as dissimilar crystals upon cooling. The harder crystals support the load, and the softer crystals permit the bearing crystals to adjust themselves to the surface of the journal. The wear of the softer crystals also leaves slight depressions for the retention of lubricant. This quality prevents seizing when a journal is started, or when it is excessively loaded.

The original white-metal alloy for lining bearings, proposed by Isaac Babbitt in 1839, was composed of 24 parts tin, 8 parts antimony and 4 parts copper. There have since been many variations of this formula, most of them improvements for certain purposes.

In general, the quality of a babbitt metal is judged by its tin content. Tin gives the alloy toughness and ductility. Copper acts as a hardener and also unites with the tin forming a chemical combination that has a suitable crystalline structure for the distribution and adhesion of lubricant. When a cheaper babbitt is desired the tin is partially replaced with lead. Antimony hardens the alloy, but causes brittleness. Lead-base babbitts require more antimony than tin-base babbitts because they are softer.

The following table gives some representative babbitt-metal formulas together with their uses:

Duty	Tin	Antimony Per Cent	Copper	Lead
Heavy pressure bearings	90	6	4	..
Heavy pressure, high speed	87	7	6	..
Moderate pressure, high speed	60	12	3	25
Moderate pressure, moderate speed	10	15	..	75
Low pressure, moderate speed	5	10	..	85

It is unwise for any one but an experienced man to attempt to make his own babbitt metal either from new metals or from scrap, since the resultant product will be of uncertain composition and will contain oxides and other impurities. An alloy should be selected that is suitable and economical for the intended use. For heavy loads and impacts a babbitt having a high tin content should be used. For large bearings and light loads a cheaper alloy having a large lead content will be equally satisfactory. For a hardened journal a harder babbitt may be used than would be an economical selection for a soft machine-steel journal.

Preparing the Shell

When a bearing is to be relined the first step is to cut or melt out the old lining and thoroughly clean the shell. This is done by sand blast, tumbling, wire brush or pickling. Anchor holes and grooves should be carefully cleaned out. Tinning is the approved method of anchorage for bronze shells and it is, to some extent, used for iron shells, usually in conjunction with anchor holes or grooves. Half-and-half solder is used for tinning, with zinc chloride as a flux. The tinning operation may be performed by dipping, in which case the parts not to be tinned are covered with a mixture of graphite and water or a red-clay wash. Superfluous solder is brushed or swabbed off.

Bearings are sometimes lined with the shaft in place, but usually this is done only in emergencies. Better practice is to use a mandrel, since extra metal can be left for finishing. The mandrel can be prevented from sticking by wrapping with paper or coating with oil, chalk, black lead mixed with cup grease, or clay wash. Arbors for a single pouring can be made of wood, although metal is preferable.

All openings except the inlet hole must be stopped up during the pouring operation. For this purpose fire clay, putty, or old pipe coverings (pounded, sifted, and mixed with cylinder oil) may be used, backed up with cloth or tape if necessary. Leather strips may be used as end fillings and to give a proper depth of lining between arbor and shell. Boards with circular pieces cut out are often used for backing in the case of large bearings. The ends of the mandrel or shaft fit in the holes and paper is used for gaskets between the boards and bearing shell. Clamps hold the boards in place. Where much babbitting is to be done, jigs of various kinds are employed.

Molten babbitt coming into contact with cold metal sets and shrinks before completely filling the mold. Therefore, whenever possible, shell and journal, or mandrel, should be preheated enough to allow a smooth flow, but not enough to cause separation of the heavier metals, lead and antimony. Bronze shells may be heated to 212-300 deg. F., and iron shells to 430-500 deg. Fahrenheit.

The metal to be poured should be melted in an iron pot maintained at a temperature between 800 and 900 deg. F. Underheated babbitt forms a coarse casting and overheating causes oxidation and impairs the antifriction qualities. Scum should be skimmed and kept from entering the mold and the ladle should be held near the inlet in order to avoid the formation of air bubbles. Good results are obtained by pouring against the mandrel with the shell in a vertical position.

In some cases it is impossible to give any further finish to the bearing after pouring, and under these conditions the bearing is expected to wear in and find its own seat. Best results are secured by boring and then broaching or scraping to a final fit. Linings to be machined should be peened with a hammer, preferably while still warm. A sharp tool having appreciable rake is best for boring. When the bearing is to be finished by scraping it may be covered with Prussian blue, red lead, or chalk, and tested by putting in and turning the shaft. The coloring is rubbed off the high spots and these are removed. This process is repeated until a close contact is obtained.

A clearance of about 0.001 in. per in. of diameter of the journal is allowed for the oil film and for heat expansion.

After all other tooling of the bearing has been finished the oil groove should be cut and the edges of the groove chamfered. This is important because sharp edges wipe the oil from the journal.

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· TECHNICAL · ABSTRACTS ·

Pioneer Days of Purchasing

The telephone company was probably the first large buyer to rate the elements of purchasing in this order of importance: quality, service, price. Certainly it was the first to realize that it had to buy good will along with its supplies, and to express this realization in its buying negotiations. Quality was defined as appropriateness, the material best suited for the job, and was established by specification and inspection. Service meant that a sufficient quantity could be delivered as ordered to maintain stocks and keep the inventory cost low. Price was the lowest consistent with the other two requirements.

The purchase engineering department, believed to be the first of its kind, was established to keep down purchasing costs by engineering and economics instead of by strong-arm methods. The purchasing engineer is expected to know all about the materials used by the telephone company and acts in an advisory capacity as well as being an information bureau. Since he does not conduct any buying negotiations he is unbiased by the personality of any salesman.

The two underlying facts fundamental to sound purchasing are: that price is secondary to quality and service; and that a live-and-let-live policy will earn better profits for the buyer as well as the seller.—Albert L. Salt in *The Magazine of Business*, January.

Engineering Education in Relation to Engineering Societies

It was a recognition that the professional societies have a vital stake in engineering education that led to a series of special inquiries by the national bodies of chemical, civil, electrical, mechanical, and mining engineers. Out of 2,000 consulted, nearly 1,200 replied, and 1,060 sent replies in time to be compiled and analyzed in detail. The data of this inquiry reduce the attitude of the profession at large to an orderly basis, in which a fairly definite policy is implicit:

Engineering is regarded as an open profession, accessible to both self-educated men and men of formal scientific culture. College training is accepted as the first normal step to professional standing, but experience in subordinate capacities under the guidance and criticism of qualified practitioners is an indispensable part of an engineer's training. Engineering is seen as a broad function in social economy with varied types and grades of responsibility. Four years in college is tacitly accepted as a reasonable period of training for the average man.

These engineers would limit formal teaching largely to the underlying principles of engineering, its methods of analysis, its verbal, symbolic, and graphical language processes, and its setting in contemporary civilization. They recognize that professional preparation may be begun in school, but must be completed in practice. Curricula should be built up from humanistic, scientific and technological materials of a basic character, and include as a common foundation a substantial core of English and economics, mathematical and physical science, and the scientific bases of enginering technology. The quality of engineering education is determined primarily by the qualifications and effectiveness of teachers and the endowments and preparation of students. Teachers should have both scholarly preparation and professional experience, and should be in active touch with engineering practice. As far as practicable students should be selected for aptitude as well as scholastic attainment.

About nine out of ten favored the idea of national societies exercising a more direct influence on engineering education and about two out of three favored an approved list of colleges whose students would be credited with work toward membership in the societies.

To summarize, the author recommends the following course of action for engineering societies:

1. Act jointly—pool your interest with sister societies and colleges.
2. Take active measures to guide American youth in its consideration of careers.
3. Create a joint accrediting agency for colleges of engineering.
4. Re-examine and, if practicable, codify your rules of admission to membership.
5. Through student branches educate students in the history, traditions, ethics, and social functions of the engineering profession.
6. Create joint sanctions for the award of professional degrees, and relate them to terms of admission to professional grades of membership.
7. Take a large share in directing the after-college education of young engineers.
8. Certificate the educational and professional attainments of engineers within the profession.
9. Take measures to create other credentials of educational attainment in addition to college degrees.
10. Do your part, through joint agencies, to promote the corporate welfare of engineering education.

The responsibility of the profession as an organized body relates to the corporate prosperity and development of engineering education. The total neglect of this interest in America is in striking contrast to its active cultivation abroad under government auspices. —W. E. Wickenden *Mechanical Engineering*, February.

Data on Hydraulic Feeds

While hydraulic feeds have not been applied to all types of machine tools, results achieved on those to which they have been applied have been generally satisfactory. Proponents of hydraulic feeds believe their experiments have definitely proved that less force is required to pull a broach in a hydraulic machine and that tool life is longer than with other types of broaches. It is pointed out that the formation of a chip is by no means a continuous process involving a constant pressure on the tool, but that there is a definite cycle of pressure for the formation of each chip element. Under actual cutting conditions these load variations on the tool and machine occur at very high speeds —possibly as high as 1,000 per second. There are also load variations as each tooth enters the work and another variation caused by the eccentricity of the cutter.

In mechanically fed machines there is relatively less flexibility to yield against these load variations so that the maximum instantaneous loads may be very high. Due to the compressibility of the oil in hydraulic mechanisms and the relief afforded by leakage of oil past a piston, a more uniform pressure is applied by them.—By K. W. Stillman. *Automotive Industries*, January 28.

Grinding as a Correction Factor

Since grinding has become the recognized finishing method for many parts that in the past were finished in the lathe, the responsibility for the production of good work has fallen upon the shoulders of the grinding machine operator. It is a fact, however, that much scrap has been made in the grinding department, which, if the turner had been more careful about his limits, his finish, and particularly his centers, would have been produced as good parts. —*Abrasive Industry*, January, 1928.

Real Fire Protection Is Fire Prevention

Many kinds of fires are prevalent and for each of them there is an extinguisher that is the most effective. For the ordinary fire of wood and rubbish, almost any good extinguishing device or even water alone will usually bring results, but for the extra-hazardous fires such as those of oils, greases, paints and other inflammable materials found in the plant, the simple remedies will not suffice.

There are only two ways of extinguishing fires, one by cooling the burning material down below its burning point and the other by excluding oxygen. The "cooling" method is employed in extinguishing devices that discharge

principally water, such as soda or calcium-chloride solutions.

Two types of extinguishing devices employ the smothering principle, one using a free gas and the other a foam. The gas smothering types having a carbon tetrachloride base produce a heavy free gas that seeks the floor level. The advantages of this type are: First, its stream is a non-conductor of electricity, and, therefore, safe on live, high-voltage electric fires. Second, because of its convenient size and the fact that it has a low freezing temperature, it is adapted to use on automobiles, trucks, and motor boats. The gases produced by it seek the floor level and thus make its use valueless for overhead fires or fires of large area which the blanket does not completely smother or where it may become dislodged or dissipated by drafts of air or the draft of the fire.

The surest and most satisfactory way to ascertain just what type of equipment will best protect your particular risks is to consult organizations who offer complete fire protection service.—James A. Harte, *Industrial Engineering*, January.

White Metal Bearings

Thorough cleaning and tinning is the first essential of good white metal bearings, but very few reliable data are available regarding the influence of such factors as temperature of the tinning bath, white metal, work and mandrel, the nature of the surface of the bearing shell, whether rough or finished, machined, etc. With the object of throwing some light on these points, a series of tests was carried out to determine the actual adhesion obtained between various metals under different conditions.

In practice, however, it is not necessary to carry out exhaustive tests covering all these conditions, since it is already known that certain conditions, such as tinning, are essential in making a satisfactory joint. The tests carried out, however, demonstrated that thorough cleaning and tinning are absolutely essential for all types of surfaces and materials. The only case in which this may not be of such vital import is when rough cast-iron bearing shells are drilled, dovetailed, or recessed, to provide a mechanical key for the lining. Poor results were obtained when test pieces were re-babbitted without the previous tinning being completely removed.

All rough cast-iron test pieces were sand-blasted, pickled, and tinned, and machined test pieces were pickled and tinned. The white metal was poured at a temperature of 600 deg. F., the test pieces being at 550 deg. F., the composition of the white metal employed being 70 per cent tin, 18 per cent lead, 6 per cent copper, and 6 per cent antimony. Tests were also carried out using Admiralty white metal, i.e., 85 per cent tin, 6.5 per cent copper, and 8.5 per cent antimony.

In the case of gun-metal bronze all rough cast test pieces were sand-blasted, pickled and tinned. The best results were obtained with a smooth machined surface, or with a fairly smooth surface on which exceptional care had been taken in pickling and tinning.

With mild steel test pieces, good adhesion of white metal on a machined surface is fairly easily obtained. All pieces were pickled and tinned, and careful attention was paid to temperatures. The best results were obtained with a temperature between 718 deg. F and 725 deg. F., giving a pouring temperature of 640 deg. F. The temperature of the tin bath and test pieces was between 504 deg. F. and 515 deg. F., and the chill temperature 280 deg. F. Under these conditions the best adhesion was obtained with rough machined surfaces where the actual tension figures ranged from 12.36 tons when no special precautions were taken in cleaning and tinning, to 14.6 to 15.5 tons when thorough pickling and tinning were insured. With smooth machined steel surfaces, the results were not so good, being from 2.9 to 8.8 tons over the diameter of the test piece. The highest figure reached corresponds to an efficiency in the joint of nearly 72 per cent.

The general conclusion is that the temperatures of the white metal, tinning bath and shells are of secondary consideration, providing overheating is avoided. An actual pouring temperature between 600 deg. F. and 650 deg. F., with the tin bath at 505 deg. F. to 515 deg. F., and the shell at the same temperature as the tin bath, will give satisfactory results. The temperature of the mandrel and back plate or mold is more important, and for this reason a gas jet may be arranged behind each plate to maintain the parts at the correct temperature, and it is advisable to provide pockets in these parts for the insertion of thermometers to check the temperatures when desired.

Sand-blasting is essential for unmachined surfaces, and in pickling the distinction between thorough pickling and merely immersing the shells in the acid bath for two or three minutes must be emphasized. The time required to pickle a casting depends to a certain extent upon the strength of the acid and the size of the work, but, generally speaking, the operation should occupy from fifteen minutes to half an hour. Ordinary sulphuric or hydrochloric acid will not attack sand or the black oxide of iron which forms the scale on the casting, but the acid soaks through and attacks the iron underneath the scale until a sufficient amount is dissolved to loosen the scale, etc. The time factor is, therefore, very important. Upon leaving the acid bath the work should be washed and scrubbed, preferably with hot water. It is good practice after washing to immerse the shells in a soda solution to neutralize any acid that may remain.

For high-speed bearings with intermittent heavy loads, as in internal combustion engines, it is most important that perfect adhesion or union of the metals should be obtained over the entire surface of the bearing shell, since an imperfect joint, even over a small area, retards the conduction of heat from the white metal to the shell and bearing housing. There is no advantage in a thick bearing shell, or in a thick lining of white metal. In fact, the minimum thickness consistent with facility in casting the white metal should be adopted.—*The Automobile Engineer*, January.

Roller Bearings Cut Down Power Costs

One of the most difficult applications, from the standpoint of mechanical as well as of load requirements of antifriction bearings, was that made to the roll necks of various types of rolling mills. The bearing as actually developed for this purpose is exceedingly simple, both in construction and as concerns the mechanical operations necessary to install it. It consists essentially of two double cones or lower races, four sets of tapered rollers with individual cages, and three cups, one of which is double. The assembly is a three-part operation, the cups, cones, and rollers being all assembled inside the bearing chuck. The complete assembly may be slipped on and off the rolls as a unit without in any way disturbing the bearing adjustment, thus simplifying repair work.

Since the projected area of the two double cones is nearly equal to that of the roll necks, the unit pressure per square inch permits the loose fit of the cones on the neck without any danger of chafing. By virtue of this construction, not only is the assembly of the rolls in the mill rendered a simple matter, but their removal, or the removal or replacement of a bearing, is also facilitated to a great extent.

Another interesting feature of these bearings is their compactness. Their width has been kept well within the limits imposed, without any sacrifice of their ability to withstand any of the radial or thrust loads likely to be encountered in service. With regard to the latter type of load, experience has shown that the thrust capacity of the bearings is such that they can easily handle the maximum peak thrust loads met with.

The advantages obtained from the use of these bearings may be listed in the order of their importance: Improved continuity of service, considerable saving in power consumption, and decreased lubrication and maintenance cost. With regard to the first, experience has already proved that not only are the delays from shutdowns due to bearing failures or troubles materially decreased, but the machine can be worked steadily over longer periods of time without the necessity for inspecting and rehabilitating the bearings. As to the second point, the early experiments showed that savings in power consumption up to as high as 60 per cent might be expected, a prediction that has since been borne out by the average savings obtained from a number of installations having widely varying service conditions. The improvements claimed in the matter of maintenance and lubrication are just as marked, and have been equally justified by the results obtained in practice.—*The Iron Age*, January 26.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Profits Must Come from New Methods

ACCORDING to the thought of an executive of more than average ability, "Profit in industry must now come from new economies." When competition becomes too severe, there must be a revision of prices or a cutting of costs. If the existing method of making the product does not allow either, the method must be changed. Two examples that illustrate this principle are the continuous rolling process of making steel sheets and the fully automatic method of producing automobile frames. Both have been developed in highly competitive fields.

The average profit in business today is small. In some industries there is room for appreciable cutting of costs. Perhaps prices can be lowered in others. On the whole, however, these low profits indicate that we are approaching an era of radical change of method.

Educational Munition Orders

THE proposal of the Secretary of War that existing laws be amended to permit the placing of "educational" orders for ordnance equipment with industrial firms deserves the solid support of every patriotic American. Under existing laws such equipment can be built only in Government arsenals or factories, so long as they can produce at an economical cost. In view of the fact that the arsenal does not have to include officers' salaries or plant overhead charges in its estimates it can always underbid any industrial company.

We spend many thousands of dollars yearly for armories and the training of citizens in military evolutions, yet under present laws we are not able to train the industries to which we must turn for equipment in an emergency. The law places them in exactly the position they held in 1917 and unless it is amended another hurry call will lead to the same unorganized haste, delay and waste that ran our was costs up to such prodigious figures.

The educational order is an effort to provide some measure of experience for the industrial organization. Through its provisions a small order for a given item would be placed with a selected company and the cost of tooling up for the job would be borne by the Government. The size of the order would be just large enough to permit what might be called a sample installation to function for a short period. Provided the product passed inspection it would be assumed that the organization had sufficient knowledge and experience for a period of years without further orders.

Many people cannot overcome the feeling that preparedness leads to an aggressive policy on the part of the prepared. They should not forget that wealth, weakness and safety cannot all be maintained simultaneously by any nation. The safety of the United States from attacks depends directly on the extent to which preparations for defense have been made. On the other hand, the likelihood of aggression by the United States is unthinkable. No aggressive war has ever been undertaken in the past and there is even less reason for such action today.

Urge your Senators and Congressmen to support this legislation.

Poor Lubrication Costs One Company $120,000

OIL, in spite of its financial and political vagaries, is a most important item in all machine using industries. And not so much as to the expense of the oil as to the cost of repairs and of delays when bearings seize or fail from lack of it.

Just how much this total is in this country each year is a matter of conjecture, but one large concern that keeps a careful record of its maintenance costs, places its own loss at over $120,000 a year for the past five years. And this covers only the cost of maintenance, not the idle machine time lost because of it.

With a loss of $10,000 a month staring one in the face there can be no question as to the necessity of giving the question of lubrication much greater attention. Machine designers and users can well co-operate to reduce the heavy toll on industry. It is not only the question of getting oil to the bearings but of getting it there positively and regularly, and of having it clean and free from impurities when it arrives.

A positive supply of lubricant by gravity, pump, splash or cascade is evidently necessary. And beyond this is the necessity of keeping the oil clean and fit by filters and by purification. All these devices cost money, but they are worth what they cost. And it's hardly playing the game to expect the machine builder to spend money to decrease the user's maintenance costs without adding it to the price of the machine.

Madison-Kipp Die Casting Machine

ALTHOUGH for many years the Madison - Kipp Corporation, Madison, Wis., has been using the die-casting machine illustrated for manufacture of lubricating systems at its own plant, only recently has it been built for general distribution. Coincident with the development of the machine has been the development of a die designing department and a tool room so that the company is now able to offer complete facilities for die casting service.

Some of the important features of the machine are as follows: The operation of the machine is completely automatic with safety features covering the movement of the metal, movement of the die, and movement of the cores. The only functions of the operator are to manipulate the single clutch lever, supply new metal, clean and oil the die with an air hose, and watch the castings. The machine can be stopped with the die in any position and reversed from any position. Standard zinc- and aluminum-base metals may be used in the machine and the usual type of factory labor can operate it. In no case is more than one operator necessary. The machine and dies are so constructed that the cores can be pulled only in the proper order and metal cannot be "shot" unless the die is closed and the "goose neck" in casting position.

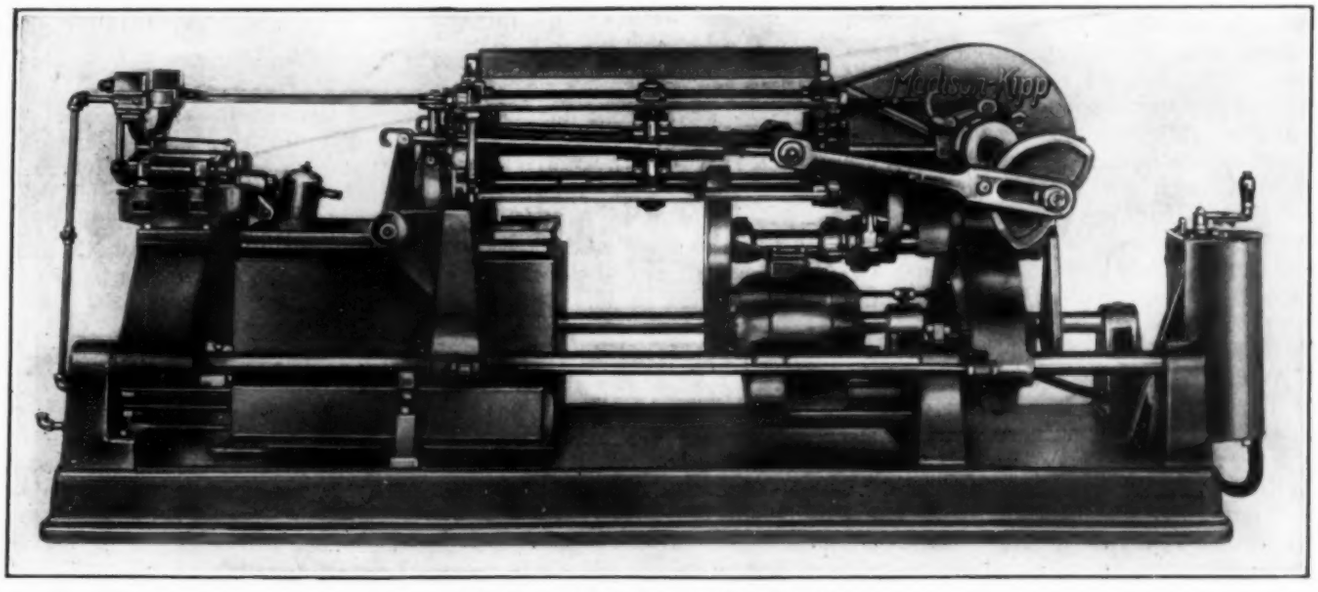
The machine is operated by a 2-hp. multi-speed motor without the use of a gear box. The machine can be operated at 4, 6, 8 or 12 shots per minute. From the motor the drive is through back gears to a worm and wormwheel which drives the shaft on which the specially-designed dwell crank cams are attached.

The stationary half of the die is attached to the hot plate of the machine while the movable half is mounted on the reciprocating carriage, which obtains its motion from rods connected to slotted connecting rods, eccentrically mounted on the crank cam. With the machine in the position shown, the dies being open, the cam roller rides over the cam and causes the carriage to be advanced with a gradually-accelerated movement until the die is closed. This closing occurs shortly before the cam roller reaches the two-lobed action of the cam. These two lobes have no effect upon the carriage movement other than to exert pressure against heavy coiled springs located behind the carriage, thus holding the die closed. During this part of the cycle the crankpin moves forward and back in the slot in the connecting rod. Simultaneously, a charge of metal is shot into the die and is given sufficient time to solidify. To open the die, the cam roller leaves contact with the cam, and the crankpin pulls against the rear end of the slot in the connecting rod and draws the carriage and the movable half of the die back to the full open position.

It should be noted that the accelerated movement of the die causes the two halves of the die to come together at sufficient speed to assure proper engagement, and conversely the highest speed in the cycle is available for breaking the die open and pulling the cores at the start. The cams provide the accelerated action and forward movement, and the decelerated action on reverse. This allows sufficient time for cleaning the dies and putting inserts in place.

The goose neck automatically dips into the metal pot, is filled with metal, is then raised to casting position under the die and at the same time is connected with the air chamber so that pressure may be applied for forcing the metal into the die. This action is accomplished by means of push rods connected to the slotted connecting rod and actuating a ball crank. When the goose neck is raised into casting position, it makes contact with the air chamber and the die at the same time, and, as soon as the shot has been made, the goose neck is lowered into the metal pot, thus breaking contact both at the die and the air chamber, after the air has been exhausted from the air chamber.

Inserted between the goose-neck nozzle and the die and pivoted to the



Madison-Kipp Die Casting Machine

frame of the machine, is a nozzle plate which is rocked into position by the action of the nozzle at the forward end of the goose neck. This nozzle plate is flat on top where it comes in contact with the die, while on the bottom of the plate there is machined a seat corresponding to the shape of the goose-neck nozzle. The purpose of using this nozzle plate is to prevent any tendency to spread the two halves of the die and produce a fin on the casting.

When the two halves are together and the goose neck is in place, the machine is ready to have air pressure applied behind the metal in the goose neck to force a shot into the die. This action is also automatically accomplished by means of a cam on the main wormwheel shaft. The roller follower is on a small bell crank, or trip, by means of which the rod connected with the air valve at the rear of the machine is pushed forward. At the opposite side of the machine from the air pressure valve is a similar mechanism that opens the exhaust valve so that before the goose neck is dropped out of engagement with the nozzle plate and die, all the air in the air chamber is exhausted. This is a safety feature in addition to the fact that the goose neck breaks contact with the air cylinder as soon as the machine begins the backward part of its cycle.

THE FURNACE

The machine is equipped with a fire-brick-lined, cast-iron furnace, and a cast-iron pot, which can be removed from the furnace compartment. The furnace rests upon the base of the machine and is also removable. The working mechanism, including the motor, is carried on a slide provided by bearings on the round guide bars seen just above the bed of the casting. This entire section can be moved back from the furnace so as to allow room for removing the furnace and the metal pot, or for any prolonged work on dies.

As has been stated, the operation of the dies and the mechanism required in the dies is automatic. Advancing and withdrawing of all cores and the operation of ejector mechanisms are controlled by cams carried on members known as combination bars. Provision is made for mounting six of these bars, two on each side, and two above the carriage on which the movable half of the die is mounted. By means of these combination bars and cams mounted on them, cores can be pulled in any direction and at any angle.

Provision is made for air and water cooling of the dies, and for the mounting of splash guards and chutes for carrying away the finished castings. The machine occupies a floor space of 120x34½ in. and is 51 in. high. Its weight is 6,800 lb. The machine is automatically lubricated by a Madison-Kipp fresh oil system.

"Klose Kwarter" Wrench

A wrench especially designed for use on hard-to-get-at nuts is being made by the Billings & Spencer Company, Hartford, Conn., under the trade name of "Klose Kwarter"

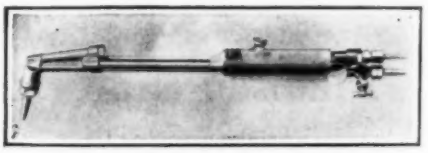
"Klose Kwarter" Wrench

wrench. It is a double-headed wrench with openings at a 75-deg. angle, jaws narrow and pointed, and thin heads. Both heads are on the same side of the wrench and afford a comfortable grip and good leverage.

The wrench is made in all popular sizes to fit S.A.E. and U. S. Standard nuts. For automotive use they are packed five wrenches in a kit, giving an assortment of ten openings, varying in size from $\frac{3}{8}$ to $\frac{7}{8}$ in. The wrenches are all drop forged from chrome-molybdenum steel.

Oxweld Type C-14 Cutting Blowpipe

A cutting blowpipe, known as type C-14, which will not backfire even under the most severe operating conditions, it is claimed, has been added to the line of the Oxweld Acetylene Company, 30 East 42nd St., New York, N. Y. This blowpipe uses the same nozzles as the Oxweld type C-2, which it resembles, although several improvements in design have been made. The three gas tubes are straight, having no bends either outside or inside the handle. The cutting valve is of the same design as has



Oxweld Type C-14 Cutting Blowpipe

been used on the type C-6 for many years and is now used on all hand cutting blowpipes of the same make.

Some time ago the small needle valve bodies used for acetylene on the cutting blowpipes were improved by making them pressure forgings. Now, in addition to these, both the head and the rear body of the type C-14 blowpipe are also pressure forgings, instead of castings. The result is better appearance, increased durability and less weight.

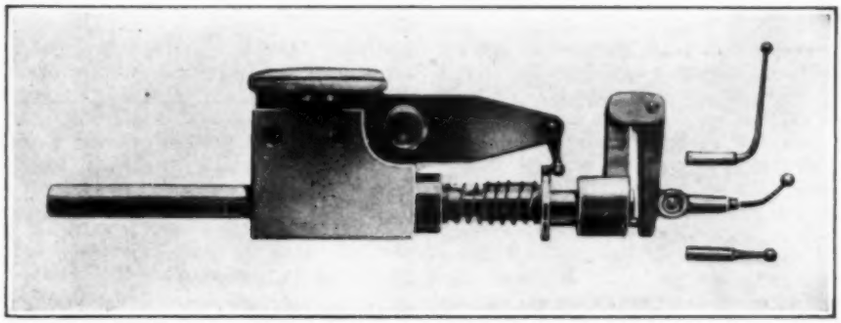
Interchangeable nozzles are provided so that the blowpipe may be used with either medium or low pressure acetylene. The low pressure nozzle can be used with a medium pressure acetylene supply if low pressure is maintained in the hose and blowpipe. The apparatus has been given complete tests in both the field and laboratory.

Centering Attachment for "Last Word" Dial Test Indicator

An attachment for use in centering holes and buttons on jig boring machines and milling machines has been developed by A. G. Schwieterman, 109 Illinois Ave., Dayton, Ohio, and is being marketed by him for use with the "Last Word" dial test indicator, made by Henry A. Lowe, 1874 East 66th St., Cleveland, Ohio.

When centering work on a jig boring machine or milling machine, where the work is held stationary while the spindle revolves, the usual method is to fasten the test indicator to the spindle and to revolve it by hand to four quarter positions. This is of course a slow process. The idea of the attachment is to rotate its spindle with the spindle of the machine by power at the speed of the boring operation, while the test indicator itself is held stationary. With some practice work can be centered within 0.0001 in., it is claimed, in 15 to 20 seconds.

When the indicator device is to be used for locating the center of the



Centering Attachment for "Last Word" Dial Test Indicator

hole, the boring tool is first inserted in the chuck, and the center is located approximately. The boring tool is then removed and the indicator device is placed therein with the feeler finger adjusted to the size of the hole. By holding the indicator as the chuck rotates, any variation in the location of the shank of the center finder will be apparent on the indicator.

All parts of the attachment are hardened, and all moving parts are ground and lapped. Three quick-changeable feeler fingers are available: No. 1 size is for holes up to $\frac{3}{4}$ in. in diameter, No. 2, $\frac{3}{4}$ to $1\frac{1}{2}$ in. in diameter, and also for locating buttons, while the No. 3 size is for holes from $1\frac{1}{2}$ to 3 in. in diameter.

Whitney No. 6 Slitting Shear

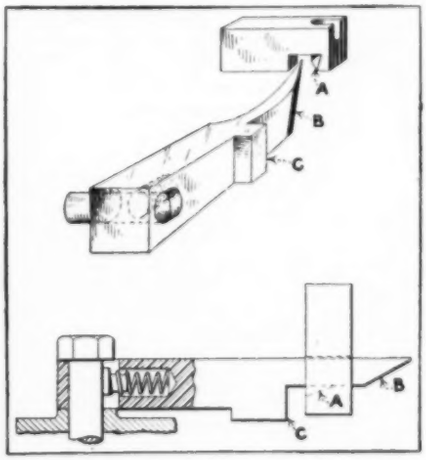
A ROLLER - BEARING slitting shear has been added to the line of punches and shears made by the Whitney Metal Tool Company, Rockford, Ill. The unit is made of alloy steel, drop forged throughout, and all wearing parts are hardened. The eccentric crankpin and trunnion bearings are all of the roller type, and the machine is throatless.

Whitney No. 6 Slitting Shear

The capacity of the shear is for all thicknesses up to and including $\frac{3}{16}$ in. The shearing blades are inserted, and are $4\frac{1}{4}$ in. in length. The lower shearing blade is adjustable for wear.

Shock Absorbing Latch on Loshbough-Jordan Presses

Inclinable open-back punch presses made by the Loshbough-Jordan Tool & Machine Company, Elkhart, Ind., are now being equipped with a safety latch and shock absorber for which a patent has been applied. The idea of the shock absorbing latch is to stop the momentum of the shaft with the latch instead of a brake, and to do it without breaking the clutch pin.



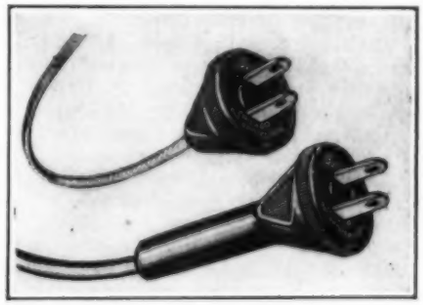
Shock Absorbing Latch used on Loshbough-Jordan Presses

With this shock absorber latch it is possible to operate the press at 25 to 50 per cent higher speeds than is usually recommended without sacrificing the safety of the press or the operator. Such higher speeds are made possible because the latch practically eliminates the brake, which slows up production due to heating the bearing next to it. In addition, a saving of power is accomplished, since about 10 per cent of the power required to operate the press is usually consumed by the brake: with the brake eliminated most of this power is saved.

The accompanying diagram shows the operation of the latch. At *A* is the beveled slot in the clutch pin that engages the wedge-shaped latch *B* when extracting the clutch pin from the flywheel. The shoulder *C* receives the impact of the clutch pin and the shock is absorbed by the spring shown.

Belden Soft Rubber Plug

The Belden Manufacturing Company, 2300 South Western Ave., Chicago, Ill., has added to their cord department a line of plugs, made of solid, soft rubber. The plugs can be dropped, knocked about, or jumped upon without injury. They are shaped to form a convenient grip for the fingers when plugging in or pulling out, and are attractive in appearance. The insulating qualities make them suitable for use in damp places, and the soft rubber construction makes them desirable for all devices that require a non-breakable plug for uninterrupted service. The plug is made in different shapes for various uses.



Belden Soft Rubber Plugs

The Belden soft rubber plug is sold only as a part of the Belden cord service, and is furnished attached to this company's many varieties of cords. Cords with plug attachments come in 10, 20, and 50 ft. lengths.

Trade Catalogs

ANTI-FRICTION BEARINGS. The Timken Roller Bearing Co., Canton, Ohio, has prepared a small illustrated pamphlet entitled "The Truth About Anti-Friction Bearings." All commercial types of anti-friction bearings are first described, followed by a detailed discussion of the advantages of the Timken type of tapered roller bearings. Combined load capacity and positive roll alignment are featured.

ARC WELDERS. The Fusion Welding Corporation, 103rd St. and Torrence Ave., Chicago, Ill., has prepared a descriptive bulletin of the "Fuzon" arc welders. The treatment is entirely technical in character and covers such points as stability, excitation, current control, weld quality, welding cost, and capital investment. The bulletin is illustrated.

ELECTRIC FURNACES, HIGH-FREQUENCY. The Ajax Electric Furnace Corporation, Division of the Ajax Metal Co., Ajax Park, Trenton, N. J., recently published Bulletin No. 4 on the oscillator or spark-gap type converters and high-frequency furnaces of the Ajax-Northrup type. This method of melting by induction currents is first explained. The construction of various furnaces is described with the aid of photographs and cross-sectional views. The converters are then described in detail. A history of the development of this type of furnace is appended.

KNIFE GRINDERS. Samuel C. Rogers & Co., 191 Dutton Ave., Buffalo, N. Y., have published Catalog No. 50 A on its products. This line includes full-automatic and semi-automatic feed knife grinders of both the floor and bench type, full-automatic sectional wheel grinders, and saw sharpeners, of both the belt-driven and motor-driven type. Other saw sharpening equipment is also included. In the beginning of the bulletin cup wheel grinding versus straight wheel grinding is discussed. The catalog contains forty 10½x7-in. pages, and is well illustrated throughout, largely with photographs.

MAGNETIC SEPARATOR PULLEY. The Cutler-Hammer Manufacturing Co., 80 Twelfth St., Milwaukee, Wis., has prepared Publication P-26, entitled "Magnetic Protection." It gives complete information on magnetic separator pulleys, and explains in detail their construction and design. There are several helpful tables giving the capacity, in cu.ft. per hour, of all separator pulleys, and the correct width and thickness of the belt to be used. The publication is well-illustrated throughout, largely by photographs of actual installations.

MOTORS AND MOTOR GENERATORS. Engberg's Electric & Mechanical Works, St. Joseph, Mich., has recently issued two bulletins on its products. Bulletin No. 6023 is on direct current ball-bearing motors of both the constant- and adjustable-speed types. Complete dimensional data and specifications are given for each motor, as well as complete lists of all accessories, including both manual and automatic controllers. The bulletin contains eight pages. Bulletin No. 6025 is on motor generators. Features of each principal part of the sets, together with the ratings, are discussed in turn. Specifications and dimensional data are also given in this case. Both bulletins are illustrated.

PYROMETERS. The Brown Instrument Co., Philadelphia, Pa., has published a booklet entitled "How the Other Fellow Does It." In it is shown a wide variety of pyrometer installations in the metal working industries with reference to variety of heat-treating processes, variety of products heat-treated, and variety of furnaces, such as gas-fired, oil-fired and electric, of various makes. Each installation is illustrated and briefly described.

RESISTORS.—The Monitor Controller Co., Baltimore, Md., has prepared a pamphlet designated as Bulletin No. 111, on its "Edgewound," "Hexwound," and "Smoothwound," resistors. The various types are all illustrated, both in detail and in assembled views. A table of ratings, weights, and dimensions is included.

WELDING EQUIPMENT, GAS. The Torchweld Equipment Co., 224 N. Carpenter St., Chicago, Ill., has prepared a well-illustrated catalog on its products. The line includes various types of welding and cutting torches, welding machines, and accessories such as gages, tips, and connections.

WELDER, ELECTRIC ARC. The Seneca Electric Welding Corporation, 1202 Maccabees Building, Detroit, Mich., has published a bulletin on its electric arc welder. This unit is the a.c. transformer type, and efficiency, low cost, safety, speed, and long life are stressed. Test data compared with other types of equipment are presented. Complete specifications of the unit are given and a number of photographs are presented to show typical application of the apparatus.

Pamphlets Received

THERMAL EXPANSION OF BERYLLIUM AND ALUMINUM-BERYLLIUM ALLOYS. By Peter Hidnert, associate physicist, and W. T. Sweeney, assistant scientific aid, Bureau of Standards. Expansion determinations were made over various temperatures ranging between minus 120 and plus 700 deg. C. Expansion curves are shown and discussed. Copies of the pamphlet, known as "Scientific Paper of the Bureau of Standards No. 565," may be obtained from the Government Printing Office, Washington, D. C. for 10 cents.

AIR-HARDENING RIVET STEEL. Technologic Paper No. 358 has been published by the Bureau of Standards under the above title. The author is Harry K. Kerschman, assistant metallurgist. The pamphlet may be obtained from the Government Printing Office, Washington, D. C., for 15 cents. It contains the results of a study made at the request of the Bureau of Ordnance, War Department, of a series of alloy steels for the purpose of determining their applicability for rivets that would have a ballistic resistance at least approaching that of the armor plate they joined. The method of test and results obtained are presented in the pamphlet and indicate that steels containing a total of 4 to 6 per cent of chromium and nickel produce excellent rivets.

BELT DRIVES. The Chas. A. Schieren Co., 30 Ferry St., New York, N. Y., has reprinted in pamphlet form an article entitled "Factors in Determining Proper Center Distances for Leather Belt Drives," by Roy C. Moore, that appeared in *Industrial Engineer*. The pamphlet is illustrated.

CHINA, SALES TERRITORIES IN. The Department of Commerce, Bureau of Foreign and Domestic Commerce, has prepared a small pamphlet entitled "Sales Territories in China," by Chas. K. Moser, chief, Far Eastern section, division of regional information. After briefly reviewing the various facilities for carrying on commerce in this country, the author proceeds to discuss each of the important centers in turn. A map accompanies the pamphlet. Copies may be obtained from the Government Printing Office, Washington, D. C.

INDUSTRIAL TRUCKS AND TRACTORS. The Society for Electrical Development, Inc., 420 Lexington Avenue, New York, N. Y., has published a brochure entitled "Profitable Application of Electric Industrial Trucks and Tractors in Industry." The pamphlet contains ninety-six pages and about 136 illustrations, and was published in co-operation with twenty manufacturers of electrical industrial trucks and tractors, storage batteries, and accessories. The material is based on a survey of 200 typical plant operations made by a member of the Survey Committee of the American Society of Mechanical Engineers, H. J. Payne. For each of the industries, the operating processes of particular types of trucks suited to individual jobs are described and an outline of operating costs are given.

NEWS OF THE WEEK

British Industry Hopeful as Labor Conditions Become More Stable

Engineering activity helping machine tool builders

BY OUR LONDON CORRESPONDENT

DURING the first few weeks of the new year the feeling of hopefulness carried over from 1927 became more definite, a considerable factor being the series of joint conferences arranged between a number of individual employers and certain trade unionists. Both commercial and industrial relations have been probed and, although the fact that conferences were to be held did not go without criticism, yet efforts in that direction were but feeble, and it is not unreasonably expected that part of the suspicion and even ill feeling that manifests itself in some few shops and offices will be dispelled as the result of these efforts.

WAGES AND LIVING CONDITIONS

The employers take part in the conferences in individual rather than collective capacity; that is, they are not representatives or delegates of organized bodies. It has been estimated that collectively they represent capital employed in industrial affairs exceeding 1,000 million pounds. The metal trades are, of course, included. Then again, after an increase, the returns of unemployed workers show declines. Further, the cost of living figures show reductions and this tendency promises to continue. Great Britain has recently been free from industrial disputes as officially recorded. Last year, according to a return just published, the time lost by the 113,700 workpeople involved in disputes was 1,175,000 working days, the lowest figure for 40 years, that is for the period during which particulars can be obtained. In one respect last year showed a set back, for such statistics as are available suggest that while some workpeople, including certain engineering workpeople, obtained certain small advances in wages, a larger number of workpeople suffered reductions.

The results of overseas trading during last year, as finally recorded, were also better than many anticipations, the value of the total imports (£1,219,387,242), exports (£709,105,402), re-exports (£123,062,727), and total exports (£832,168,129), all—except re-exports—showing a definite increase as compared with 1926. Exports of imported merchandise were down something like 2½ million pounds.

One of the largest increases (more than 3 million pounds) was in machinery, with a total of £15,901,428, the exports in the same class amounting to £49,943,569, an increase of 4¼ million pounds. The imports of iron and steel (£34,038,410) did not reach the value that had been suggested as likely, a definite falling-away in this direction having been noted during the last two or three months. But even so, the position is not regarded as satisfactory and although the corresponding exports (£69,429,233) showed an increase exceeding 14⅓ millions, they have not reached pre-war figures.

As is usual, the European edition of *American Machinist* published a special return, obtained from the Board of Trade, regarding machine tools. Exports were valued at £1,611,838, indicating some increase. Similarly, imports of machine tools were valued at £1,180,370. Here the increase in value is quite definite, though the weight shows a slight decline. The result is that while machine tool exports were valued at an average of £111 per ton, the imports were valued at £154 per ton. Overseas trading in this particular direction has for some time shown a definitely declining tendency. Among the exports, lathes accounted for more than one-third, both as regards weight and value; drilling machines coming next at about one-fifth. Of the imports, lathes were still the most prominent, accounting for less than one-quarter in value and the weight, and being followed closely in value by grinding machines. In both classes, exports and imports, the miscellaneous section forms a large proportion of the totals. In all classes of machine tools the import ton values are higher than the corresponding export values, excepting as regards milling machines.

The heavy side of engineering still remains somewhat under a cloud, but improvements have been reported in the demand for iron and steel, inquiries for export purposes being specially noted. Part of this improvement is held to be due to the condition of the shipbuilding industry, which has certainly improved. But the conditions are a little variable, for while one area can reckon on fairly good employment for about six months, a more important area cannot see further ahead than two months. It is the old story here that orders are not being booked as quickly as they are being filled. Taking it on the whole, the industry is in better condition and machine tool makers are again building up hope in this direction. Some of the firms engaged on the heavier tools have lately received an increased number of orders, but here, and in fact throughout the machine tool industry, conditions vary.

The automobile industry is again picking up, but it has not been such a good business friend as had been hoped by machine tool firms. Makers of commercial vehicles of most kinds are satisfactorily employed and generally view the future with complacency, and the export business in motorcycles has been maintained, despite a falling-away in demand from Australia. Makers of textile machinery in the Lancashire district are certainly not satisfied with the present state of their order books, but one firm at least has secured a contract for export which will relieve it of any anxiety for a considerable period. One center producing hosiery machinery still finds business quiet, while makers of boot and shoe machinery are fairly well engaged.

Electrical engineering firms continue for the most part to be satisfactorily occupied. As for a long period, boilermakers are extremely slack, and no revival can be reported in production of reciprocating steam engines, but, on the other hand, some makers of Diesel-type engines are well occupied.

It is necessary to modify the reference to the Newall Engineering Co., published in the issue of this journal for Jan. 5. While the main plant of the former proprietors, Peter Hooker, Ltd., came on the market, the Newall business, including the stock of gages and special machines, has been purchased by an official of the company, and is being continued.

De Haviland in Canada

The de Haviland Aircraft Co., Ltd., of England, is considering the establishment of an airplane assembling, distributing and service depot in Canada, according to Captain F. E. N. St. Barbe, business manager of the company, who was a visitor recently to the headquarters of the Royal Canadian Air Force at Ottawa. Eventually, he said, this plan would develop into a large factory for the manufacture of the planes themselves. He declared that British aircraft manufacturers look to Canada as the most important market in the world.

LeBlond Will Build Airplane Motors

Plans are being formulated by the R. K. LeBlond Machine Tool Co., of Cincinnati, to establish a plant near Cincinnati in which airplane motors will be manufactured. The motor was made formerly by the Detroit Aircraft Engine Corporation, a Detroit concern, which is said to be in bankruptcy.

Whether the new manufacturing plant will be a part of the R. K. LeBlond Machine Tool Co., or a separate division of the company, has not been decided. Glenn Angle, owner of the patents of the motor, and Robert Winters, both formerly of the Detroit Aircraft Engine Co., have been working at the LeBlond plant at Oakley for several weeks.

The motors, which are of the radial air-cooled type, somewhat similar to the Whirlwind engine, are to be made in two series of three sizes. The first series of 3-cylinder motor develops 50 hp., the 5-cylinder 70 hp., and the 7-cylinder 90 hp. In the second series the 5-cylinder engine will develop 110 hp., the 7-cylinder 135 hp., and the 9-cylinder 165 hp. By manufacturing these varying sizes of motors, it is said, the concern will be capable of providing motors for almost every type of commercial plane. The new organization will be directed by Mr. Angle, assisted by K. W. Warren and Mr. Winters. W. A. Kimsey will be in charge of inspection; and R. Stafford will have charge of shop operations.

Auto Exports Increase

Exports of automotive products from the United States reached a new high record total in 1927 with a value of $406,007,984, a 20 per cent gain over 1926 despite a decline in production, according to the automotive division of the Department of Commerce. The average monthly export valuation during the year was $33,833,999. December fell about $5,000,000 below this average with $28,650,046 but was a little more than $2,000,000 above exports for December, 1926, although also slightly lower than November of this year.

Air Meteorology Course Begins at N. Y. U.

Interest in the fundamentals of aeronautical meteorology is so great that a course is being offered by New York University, with the endorsement of the Daniel Guggenheim Committee on Aeronautical Meteorology.

The content of the course will be about as follows: The features of the atmosphere important in its use as a flying medium will be first considered. Its composition and physical character at various altitudes; changes of temperature and pressure and their results; primary and secondary circulation systems; precipitation in its various forms; weather and its peculiarities; climatic zones and their characteristics; recording instruments and their use.

The second part of the course comprises a practical application of these features to flying, and to laying out and following air routes in different latitudes and at various seasons. Such brief study of topography will be undertaken as is necessary.

Simplified Practice Grew in 1927

Continued growth of Simplified Practice as a means of eliminating waste in industry is evidenced by the completion during the calendar year 1927, of eighteen new simplified practice recommendations, thus bringing the total projects completed to eighty, according to a review of the past year's activities of the commercial standards group, Bureau of Standards.

That simplification yields benefits sufficient to attract manufacturers, distributors and consumers alike, is demonstrated in the high degree of adherence shown by recent reviews of fifteen of simplified practice recommendations already promulgated, states Ray M. Hudson, assistant director, in charge. The report shows that acceptors representing an average of 82.61 per cent of the total volume of the industry affected are following the simplified practice schedules. These recommendations are subject to annual reconsideration to determine the desirability of further eliminations, substitutions or reinstatements. This procedure keeps the simplified practice recommendations up-to-date and in line with the best current practice of the industry concerned.

Further evidence that simplification is proving of great value to manufacturers and purchasers is found in the increased number of associations accepting the completed recommendations. The list of associational endorsers grew from 686 to 898 during the year, the individual concerns, from 2,775 to 6,676.

Mr. Hudson cites the following experiences in connection with this form of waste elimination: "One metal lath manufacturer reports reduction of $140,000 in his inventory, while a manufacturer of eaves trough and conductor pipe reports a $30,000 reduction in his inventory. One lumber company reports reduction of $250,000 on its inventory, another $474,000 due to lumber standardization program. A manufacturer of die head chasers cites a 20 per cent reduction in his inventory, another 65 per cent. Many others report better turnover, quicker delivery, and improved service to the trade as benefits accruing from simplified practice.

During the year a total of two hundred and eight business and industrial leaders, including thirty-one from foreign nations, visited the Division of Simplified Practice in Washington to learn at first-hand, the work being done by the Bureau of Standards to eliminate the avoidable waste in industry. In addition to these visitors, the Division received, by mail, many foreign inquiries for data, and numerous articles on the subject appeared in the foreign press.

Collier Trophy Awarded to C. L. Lawrance

The Collier Trophy for 1927 has been awarded by the National Aeronautic Association to Charles L. Lawrance for his work in developing the air-cooled engine. The award is made annually for "the greatest achievement in aviation in America, the value of which has been demonstrated by actual use during the preceding year."

Mr. Lawrance, the association said, was the "pioneer in the development of the air-cooled engine in America." The original model of the present Wright whirlwind engine was designed by him in 1921.

"His far-sightedness for the future of aviation in this country, and his untiring energy in the development of this engine," the announcement added, "has brought it to its present state of perfection." The engine was used on most of the big over-water flights last year.

Business Trends Now Confuse the Future

Business trends as reflected in wholesale commodity and retail price movements, volume of employment and wage earnings at the present moment present a confused picture and do not indicate what may be expected in the immediate future in way of business recovery, according to the National Industrial Conference Board.

While underlying conditions are appraised as sound, it is pointed out that living costs based on retail prices of the necessities of life, which in the past have tended to follow the trend of wholesale commodity prices with a lag of only a few months, as yet have shown no signs of rising, although wholesale prices have shown an upward trend ever since April, 1927. In the view of the board, inasmuch as final consumption determines the permanence of production the failure of retail prices thus far to reflect a stiffening of demand for goods leaves it at the present an uncertainty whether or not the upward turn of wholesale commodity prices during the past eight months is of a permanent character and actually reflects an increased demand for materials such as would foreshadow increasing industrial activity.

The volume of employment in industry has been definitely on the downward trend since July, 1920, and at the close of 1927 was approximately 20 per cent less than at the peak in 1920. Most of this decline, however, took place during a period of increasing industrial production and is known to have been due largely to increased mechanization of industry. There are no statistics available indicating to what extent the thus created labor reserve has found employment in other occupations, or to what extent it has been offset by immigration restriction. But it is significant, the Board points out, that despite the decline in the volume of employment

wage earnings of those employed in industry have shown marked stability at a high level which, during 1925, 1926 and 1927 averaged 116 per cent higher than in July, 1914. This, the board concludes, does not reflect pressure by an increasing labor reserve on the employment market.

Living costs, according to the conference board's cost of living index have fluctuated little during the past three years but on the average were slightly lower during 1926 and 1927 than in 1925. While weekly earnings of industrial workers in 1925, 1926 and 1927 averaged 116 per cent more than they were in July, 1914, living costs at the close of 1927 were only about 64 per cent higher than at the outbreak of the war.

Eye Conservation Council Re-elects Wallace

Re-election of Lawrence W. Wallace of Washington as president of the Eye Sight Conservation Council of America, which is directing a national movement for eye conservation in education and industry, was announced following the recent annual meeting of the council. Mr. Wallace, who is the executive secretary of the American Engineering Council, actively directed the work of the Hoover Committee on Elimination of Waste in Industry, which found that much economic and social waste was attributable to defective vision among industrial workers.

Guy A. Henry, of White Plains, N. Y., was again chosen general director of the council, which from headquarters in New York is now conducting field activities among pupils, parents and teachers in the South. This work, in charge of Charles F. Southard, of New York, will be extended to every state. Poor eyes, investigation discloses, is a factor in retardation among school children.

Among those elected to the board of councillors of the Eye Sight Conservation Council for 1928 is Dr. Frederick B. Robinson, LL.D., president of the College of the City of New York. Other Councillors chosen are: James J. Davis, Secretary of Labor; Dr. Arthur L. Day, director of the geophysical laboratories of the Carnegie Institution of Washington; Prof. Charles H. Judd, director of the school of education, University of Chicago; Prof. Joseph W. Roe, head of the department of industrial engineering in New York University; G. E. Sanford, Schenectady, N. Y., past president of the American Society of Safety Engineers; Richard E. Simpson, research engineer, of Hartford, Conn.; Dr. John J. Tigert, U. S. Commissioner of Education; Prof. Thomas D. Wood, Teachers College, and James T. Grady, department of public information, Columbia University.

R. M. Little of Albany, director of the Bureau of Rehabilitation, New York State Department of Education, was elected a director of the council to serve three years. William R. Wall of New York continues as treasurer.

Engineers Will Dedicate Louvain Memorial

The Louvain Library, destroyed by the Germans during the World War, and restored by American benefactions, will be dedicated on July 4 of this year, according to present plans, says a statement by the Engineering Foundation, 29 West 39th St., New York. The Belgian Ambassador, and Whitney Warren of New York, the architect, have both assented to this date, and the sanction of the Louvain authorities is expected.

The foundation is arranging for the presence of a delegation of American engineers at the dedicatory ceremonies. Under the auspices of the foundation, a clock and carillon will be placed in the tower of the new library building at a cost of $80,000, to be subscribed by members of the engineering profession in this country. About $32,300 has been contributed by engineers. Dr. Edward Dean Adams, engineer and financier of 920 Fifth Ave., is chairman of the foundation's committee in charge of the movement. The mechanical engineers lead in the amount of subscriptions, with the civil engineers second, the mining engineers third, and the electrical engineers fourth. The clock and carillon, the gift of 56,000 American engineers, will be installed "in memory of the engineers of the United States of America who gave their lives in the service of their country and its allies in the Great War 1914-1918." Dr. Adams will head the U. S. engineering contingent at Louvain.

American Committee to World Congress of Engineers

Appointed by Secretary Herbert Hoover, as honorary chairman, seventy-eight of the nation's most prominent engineers and scientists have accepted membership on the American committee of the World Congress of Engineers, to be held in Tokio in November, 1929. The permanent American committee will promote the aims and purposes of the movement and arrange for attendance of American engineers at the congress.

Promotion of international co-operation in the study of engineering science and problems in all its branches, and stimulation of a sense of brotherhood among engineers of the world are the announced purposes of the congress, which will be the first one ever held. Departments of various governments, universities, institutes and associations are invited to take part in the session, which will cover a period of two weeks. The entire enterprise is under the sponsorship of the Japanese government.

Among well known members of the American committee are Thomas A. Edison, John Hays Hammond, Samuel Insull, William B. Mayo, of the Ford Motor Co.; Charles M. Schwab, Gerard Swope, president of the General Electric Co.; Samuel M. Vauclain, president of the Baldwin Locomotive Works; Daniel Willard, president of the Baltimore & Ohio R.R.; Orville Wright, General William Barclay Parsons, James H. McGraw, president of the McGraw-Hill Publishing Co., Inc.; H. H. Westinghouse, of the Westinghouse Air Brake Co.; Alfred Sloan, Jr., president of the General Motors Corporation; Michael I. Pupin, of Columbia University, and William Green, president of the American Federation of Labor.

30 Per Cent Increase in Canadian Machinery

Growth of the machinery industry of Canada is shown in the industrial census statistics recently issued by that government, according to the industrial machinery division of the Department of Commerce. Production of this industry in 1926 exclusive of household and office machinery was valued at $29,563,000, an increase of 31 per cent over the output value of $22,516,000 in 1925, and close to the production record established in the post-war boom year 1920.

Of the 156 machinery manufacturers from which returns were received, 116 were located in the province of Ontario, 24 in Quebec, 10 in British Columbia, 3 in Manitoba, 2 in Saskatchewan, and 1 in New Brunswick. These concerns employed a capital of $59,712,000, gave work to an average of 9,548 people to whom the sum of $12,444,000 was paid in salaries and wages; used fuel and electricity worth $569,000 and by manufacturing processes added $24,924,000 to the value of purchased materials which cost $13,456,000.

Among the principal products of the industry were the following: pulp and paper machinery valued at $6,675,000; household machinery at $4,392,000; office and business machinery, $4,434,000; mining and metallurgical machinery, $1,769,000; elevators, $1,650,000; machinery parts, $1,599,000; metal-working machinery, $1,215,000; laundry machinery, $1,138,000; pumps, $1,127,000; and transmission machinery, $1,006,000.

Auto Parts Dutiable in Germany

Single parts of automobiles imported into Germany only for replacement purposes will continue to be dutiable as iron or steel products, or according to their composition, and not at the highest current rates applicable to complete automobiles, says a cable to the Department of Commerce. The cable further advises that malleable iron front axles and parts thereof are to remain dutiable at six marks per 100 kilos in unfinished form, and at 12 marks per 100 kilos when in finished form, except patent and half-patent axles, which are to be dutiable at the highest current rate applying to automobiles.

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE

Editor, Commerce and Finance, New York

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"COMING events cast their shadows before," is an old saying; but it is difficult to find support for it in the recent record of the stock market.

The available statistics show that there has been a distinct contraction in business of late. The fifty three major railway systems that have thus far reported announce an average decrease of 31.3 per cent in their net earnings for December, and a loss of 12.7 per cent in the gross. Car loadings for the week ending January 21 were 6 per cent under 1927, and the net profits of the Steel Corporation for the last quarter of 1927 were but $31,000,000, as against $53,000,000 for the same period in 1926. But it was not until about two weeks ago that prices on the New York Stock Exchange commenced to reflect the recession in trade and industry that these figures indicated, and even now there is a disposition to attribute the decline to the expectation of higher money rather than to a reduction in the purchasing power of the public.

This expectation of dearer money was partially realized last Thursday, when the Federal Reserve Bank of New York raised its rate to 4 per cent, but the stock market took the announcement quite calmly, for confidence in the future seems to be so persistent that no one will admit the possibility of a serious retrogression, and when anything untoward occurs its logical effect upon sentiment has thus far been offset by predictions of an early recovery.

Therefore the problem is to determine whether these predictions are warranted, and in how far coming events radiate sunshine or cast shadows. Any answer to the question thus formulated must be qualified, but upon the whole optimism seems to be warranted. The reason is an old-fashioned one. It is to be found in the fact that most basic commodities are much cheaper than they were six months ago. As a result, people are able to buy more and so provide our mills and factories with a market for their production. This is already the case in the steel industry where the mills are now operating at 83 per cent of capacity as against 74 per cent two weeks ago, and prices are from $1 to $2 a ton above the low of 1927. The big mail order houses also report a slight increase over last year in their January sales, and in the automobile trade competition and lower prices are having their natural effect upon the demand.

In the market for cotton goods there has also been a wider distribution at the decline made acceptable by the drop in raw cotton, and a very broad demand for both cotton and cotton fabrics is expected if the former should go as low as 16 cents a pound.

Raw wool is also steadier and woolen goods are selling more readily, although a contrary impression has been created in some quarters by an advertisement urging that retail clothiers should follow the example of the automobile dealers by offering to take old suits in part payment for new garments. It is difficult to say whether the proposal is intended to be satirical or constructive, but it has attracted wide attention and created much amusement.

The grain markets are no higher, but they have a firm undertone, and a slight advance in the price of beef cattle has helped to make the Middle West cheerful although Congress has not yet agreed upon any measure of farm relief.

Rubber dropped about 100 points when it was announced that there would be no change in the British restriction upon exports, and coffee rallied quite sharply upon the announcement that the city of Rio de Janeiro had succeeded in borrowing $30,000,000 in New York. Sugar has been quiet. But price control has killed speculative interest in rubber, coffee and sugar, and their fluctuations have ceased to have great significance.

The most dependable indicia of activity in the United States are the volume of production and the ease with which it can be distributed among consumers. Just at present the gages that register these two factors seem to be rising and as no one is carrying excessive stocks of merchandise, normal replenishment should keep industry healthfully busy for some time.

This is not to say that a commercial boom impends or that the advance in the stock market will be resumed. The week shows a further increase in brokers' loans. Call money has been as high as 5 per cent and the bond market is noticeably easier. These are not conditions that favor speculation in stocks, and experienced traders are gradually liquidating their holdings. The railway shares in particular have been quite weak at times and one or two other groups have shown signs of "bullish weariness."

Among the land banks, the mortgage companies and the insurance companies, that make farm loans, there is also to be noted a disposition to foreclose delinquent mortgages. The result has been the embarrassment of several land companies that have been in a somewhat moribund condition for a year or more. This is a sort of housecleaning that will improve living conditions.

The foreign news includes nothing sensational. Of course there will always be dark spots on any map of economic conditions that may be drawn. But just now Russia and China are the only shaded areas of importance, and the sun seems to be shining almost everywhere in the United States.

The proprietor of a chain of American hotels announces that he will spend a million dollars to equip each of the 7,700 rooms in his chain with a radio. This willingness and the ability to make such an expenditure is characteristic of the present era, and as long as it lasts acute depression is unlikely.

WHAT'S DOING IN INDUSTRY

THE OUTLOOK for first quarter business grows brighter with each week. Reports from many important industrial centers indicate a steady though conservative improvement in sales of machinery and machine tools. The automobile industry, of course, is furnishing the bulk of current orders, but there is an encouraging response from railroads, woodworking plants, electrical manufacturers and power plants. There has also been a slight flurry of activity in export business, a few good orders being reported from Europe and South America.

MOTOR CAR builders in Detroit are advancing their production schedules and considerable new equipment is being purchased. The same is true in Indianapolis with the added increase of business from woodworking plants and construction projects. A slight increase in sales is noted in Cincinnati, and Chicago reports general improvement, reaching a substantial increase in some cases.

DEALERS in New York are optimistic over the trend of present business. Up through New England current orders are not numerous but inquiries are, and better returns are looked for soon. Iron and steel producers and power projects are keeping up a demand in Canada. The South reports a slight improvement, with good prospects in view.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

CINCINNATI

A considerable improvement in the general market tone in the past week is reported by machine tool manufacturers of the Cincinnati district. A slight increase in sales is reported by some manufacturers, comparing the period with the previous week; but there was a slight decrease, comparing it with the same week of the previous year.

Selling agents report that while in the past week the demand in local territory was small, a better market is developing in this section. All express confidence that a large amount of business that is pending will be booked in the very near future.

Orders received from France, Germany and South America during the week, though not of large size, give basis for the feeling that the prospects in foreign markets are getting decidedly better. Although there were scattered orders which called for two or three tools, the backbone of the week's market was the sale of single tools and replacements, the purchasers being general machinists and miscellaneous users. The orders received from railroads and concerns in the automotive and allied trades were confined to single tools.

DETROIT

Conditions in the machinery and machine tool market in the Detroit district continue to improve. January was perhaps the best month that has been enjoyed here for more than a year and February starts out to be almost as good, and possibly better. Not only are orders coming in from manufacturers of automobiles, parts and equipment, but there are a great many inquiries and a fairly good indication that the period of depression here is definitely at an end.

Employment is gaining, and it seems likely that the gain will continue. The Ford Motor Co. is taking on a few more men and many of the other plants are adding to their forces. The auto body plants are going forward steadily. Many of them are now getting releases on contracts that were signed last year. They are also getting new orders. Consequently they are buying fair amounts of production equipment. The small shops are busy and are making numerous small purchases, mostly of grinding and milling machines.

CHICAGO

Reports from various sources are to the effect that business in machine tools for the month of January has exceeded expectations by a large margin, and is considerably ahead of last year's figures for the same month. One of the largest manufacturers in this territory, having branches in the principal cities, states that, in the aggregate, the gain amounted to thirty-three and a third per cent, with indications pointing to a maintenance of this ratio, at least for the next two or three months. A large proportion of the buying comes from general industry, manufacturers of agricultural machinery and tractors also constituting an important factor in the improved situation. From now on, western railroads may reasonably be counted on to contribute largely to machine tool trade activity, the Atchison, Topeka & Santa Fe having entered the market with initial lists of its requirements covering a wide variety of shop equipment. Other roads are expected to submit their lists in the near future. Inquiries continue in satisfactory volume, and, mostly, are of a character that indicates early closing. Dealers in used tools report trade as improving

INDIANAPOLIS

As the automobile industry begins to get into its late winter stride following the holidays, the machine tool and machinery business here shows a healthy reaction, and some leaders in the trade are predicting a little better business for the first quarter than they did immediately after the first of the year. Nothing is apparent that might indicate anything like boom times, but there are inquiries and some sales and the entire trade generally is a little more optimistic.

The other sources, however, are showing more life. For instance inquiries are increasing for road equipment machinery and construction equipment. Feelers are being put out for cranes, concrete mixers and other similar equipment and the inquiries are greater in number than they were this time last year. Buying for this equipment is expected to start shortly.

Some buying and more inquiries are being received for garage equipment. The same might be said of the demand for special machinery for furniture factories.

Thus far the demand from the railroads has been light. The weather has been severe, however, and the roads have been unable to withdraw much motive power for minor repairs. The general policy has been to keep motive power going just as long as possible and the shops have been working under restricted schedules.

NEW YORK

The sales volume for the first week of February shows no sign of diminishing from the increase of January. In many lines of special, high-production tools the increase is quite substantial and some dealers look for a better sales record in the first quarter of this year than had been anticipated.

Orders for more than single tools are not unusual at this time, although they do not make up the bulk of business. Inquiries are coming in from a variety of users of shop equipment and a good many of the quotations asked for in January are already on the point of closing.

Railroad buying continues fair, it being confined to three or four of the large Eastern roads. Motor car manufacturers are buying here and there, mostly for replacement purposes. The electrical manufacturing industry is busy and some orders have been released but many more are in abeyance. Small shops and miscellaneous users, are as a class, buying very little.

WESTERN NEW ENGLAND

The past week brought more inquiries, and were these an indication of actual bookings, business in the Western New England district would be very active. A manufacturer of a popular line of production tools says: "We have received and estimated a very large and desirable amount of business. Our company needs just a small percentage of the prospective orders figured during December and January to keep nicely occupied a large part of the year."

The railroads of New England are not buying shop equipment. The New York, New Haven & Hartford R.R. anticipates few requirements of machine tool items. The Boston & Albany has placed orders for coal handling plant equipment with a Chicago company to be installed at Allston, Mass.

Industrial conditions, as a whole, reflect a forward trend. The Locomobile company at Bridgeport is adopting new schedules to advance production to 10,000 cars a year. The Corbin works at New Britain is gradually increasing the working hours in all departments, and the Welker-Hoops company, Middletown, is purchasing and installing machinery to start the Williams street plant operating about March first.

SOUTHERN DISTRICT

Machinery and machine tool sales have shown a slight improvement in the South since the middle of January, but as a whole business is not active except in one or two lines. At the same time, the tone of present inquiries, and information being received from salesmen in the field, promises a better volume of business for the quarter than dealers had been anticipating earlier in the year.

Railroads operating in the Southeast are inquiring actively for shop equipment needs, and some fair sales of heavy equipment have been reported. The outlook in this field gives promise of a better than normal volume the next few months. Conditions are rather unfavorable for building, and contractors' machinery and equipment is as yet inactive. The same is true of road building equipment. Prospects, however, are fairly good for both these lines, though few dealers believe they will be any larger than normal. Textile plants are buying little right now and the outlook is not very promising. Few orders are reported for garage machinery and equipment for smaller shops.

CANADA

A very encouraging volume of business is reported by machinery and machine tool dealers in Canada. The improvement in industrial activity noted at the beginning of the year was well sustained throughout January, and prospects for the first half of the year are reported to be excellent. Increasing production in the automotive and electrical industries has been helpful during recent weeks, while railway equipment orders recently placed, will give added stimulus to business in the months to come.

The Canadian Car and Foundry Co., contracted for miscellaneous equipment to the extent of $2,000,000. The Canadian Locomotive Co. reports having enjoyed a good year in 1927. Output of locomotives was greater, compared with the previous year, and the company reports a gradually expanding business in other lines, including mining machinery. General Motors of Canada, Ltd., recently placed an order for a year's supply of Chevrolet car frames with the Canada Car and Foundry Co.

Several firms will benefit by contracts placed by the Back River Power Co. for equipment for its projected $8,000,000 power plant on the Back River, near Montreal. The Canadian General Electric Co. will supply all electrical equipment, generators, etc. The Dominion Engineering Works, Ltd., and the Canadian Allis-Chalmers Co., Ltd., will share in the work of building the necessary water wheels involved in the undertaking.

Transmission Association Meets at Philadelphia

"An association of equipment manufacturers brought together in their mutual interests and constituted to eliminate waste in distribution by making available a construction engineering consultant service to its buyers"—this was, in brief, the platform named by the Power Transmission Association in its regional meeting in the Poor Richard Club at Philadelphia on the evening of Feb. 3. W. H. Fisher, sales manager of the T. B. Woods Sons Co., is president of the association and presided at the meeting of some hundred members and guests.

The objects of the association were named and outlined as follows: To promote the most efficient and economical distribution of power, to make scientific study of all engineering problems connected with the transmission of power, to accumulate and compile and co-ordinate accurate and authoritative information regarding the most economical and efficient power transmitting methods and to place this information at the disposal of all power users; and to further the interests of affiliated manufacturers and their distributors making and handling power equipment.

Dr. Pupin Honored by Washington Award

Dr. Michael Pupin, of Columbia University, noted scientist and inventor, has been presented with the Washington Award for preeminent service in the promotion of human happiness, comfort and well being. The presentation was made on the evening of Feb. 2 in the Palmer House, Chicago, in a brilliant function sponsored by the four founder national societies and the Western Society of Engineers. Maj. Rufus W. Putnam, president of the Western Society of Engineers, reviewed the founding of the award by John Watson Alvord.

Prof. Arthur Compton, Nobel prize winner last year, outlined what Dr. Pupin had accomplished in the realms of invention and development. The most noted of these were his method of loading telephone cables which made long-distance telephony possible, the tuned circuit and the resonant system now used as a basis of all radio broadcasting, rectification of alternating currents and development of X-ray.

Wholesalers' Conference at Washington

A call for a national wholesalers' conference, to be held at Washington, Feb. 14 and 15, for the purpose of determining what part wholesaling plays in the changing economy of distribution, was issued last week by the Department of Domestic Distribution of the Chamber of Commerce of the United States. The meeting will bring together outstanding business men in the wholesale field, representatives of important trades, and economists to discuss problems affecting wholesaling and to map out a general program for the improvement of conditions in this branch of distribution.

W. M. G. Howse, Kansas, president of the National Wholesale Dry Goods Association, chairman of the committee on domestic distribution of the national chamber, will act as chairman of the conference.

Farrell Issues Call for Foreign Trade Convention

The steady growth of the foreign trade of the United States in the last decade is evidence of the success which American producers and traders have secured through study of the many phases of international commerce. In 1927 the volume of our foreign trade amounting to 113,500,000 tons, was the largest in our history. It comprised over 71,000,000 tons in exports and a little less than 42,500,000 tons in imports.

The increase in our trade with Latin America is particularly noteworthy. That trade, in imports and exports, now amounts to close to $2,000,000,000 or almost one-quarter of our total trade with the world. Its extension has been made possible by a steadily rising standard of merchandising on the part of those engaged in it, and its continued and permanent growth is assured.

To give special attention and careful study to important questions, the National Foreign Trade Council will hold the fifteenth National Foreign Trade Convention in Houston, Texas, April 25, 26 and 27. All those who are interested in the development of foreign trade as a factor of national prosperity, whether in agriculture, commerce, education, industry, finance or transportation, all Chambers of Commerce, boards of trade, national and state associations and other industrial and commercial organizations, as well as firms and individuals, are invited to participate.

Foundrymen to Plan Cast Iron Research

In further consideration of a proposed organization devoted to cast iron research for the betterment of the product of grey iron foundries, the board of directors of the Philadelphia Foundrymen's Association, at its last meeting, named a cast iron research committee and instructed this committee to take steps necessary to assure the holding of a meeting for discussion of this subject. Foundrymen's associations all over the country are invited to appoint a delegate to attend a meeting in Philadelphia on March 13, as a guest of the Philadelphia Foundrymen's Association, to discuss any possible research activity that may work to the betterment of the industry.

Detroit to Have Aircraft Show

Plans for the All-American Aircraft Show, to be held in Detroit, April 14 to 21, have been approved by the board of governors of the Aeronautical Chamber of Commerce.

This show is being organized and financed by the Detroit Board of Commerce. According to the terms of the board, the following conditions have been stipulated: No charge shall be made for floor space to exhibitors of aircraft; only a nominal charge of fifty cents per square foot will be made to exhibitors of motors, accessories, parts, supplies, trade papers, etc. John Harding, Jr., of the chamber, has been designated to represent the industry in connection with this show. Mr. Harding will actively participate as a member of the Aircraft Events Committee of the Detroit Board of Commerce and other important show committees having control of the direction and management of the show.

Purchasing Agents Plan Annual Exposition

The thirteenth international convention and "Inform-A-Show" of the National Association of Purchasing Agents will be held in Kansas City May 28 to 31, in the American Royal Bldg. It is expected that approximately 1,200 purchasers will attend. These members of the N.A.P.A. will come from all parts of the United States and Canada and some from Mexico. The association has a membership of approximately 5,000.

The convention program this year is being lined up to cover subjects especially related to purchasing. There will be one-hour sessions on commodities like coal, fuel oil, iron and steel, lumber, textiles and non-ferrous metals. In the N.A.P.A. there are several functional groups, such as Public Utility Group, composed of purchasers for public utilities, Government Purchasers Group, composed of purchasers for governments —federal, state, county, municipal; and Oil Company Buyers Group, composed of purchasers for oil companies. During the convention the groups will have conferences, which may be attended by any member of the association, at which problems peculiar to the men in the particular group will be discussed at length.

It is planned to have brief addresses on topics to be selected, to be followed by discussion from the floor. Speakers will be individuals competent to talk on the subjects selected. Executive meetings of the association will be held in the evenings. Election of officers will take place during the convention and the new executive committee announced at the closing session. There will be a minimum of inspirational talks. The banquet will be held on the night of Decoration Day and will be one of the high points of the meeting.

Business Items

The Burndy Engineering Co., Inc., of New York has been appointed distributor of Everdur by the American Brass Co.

The International Oxygen Co., announces the election of the following officers: A. A. Heller, president; Sol Heller, vice-president; Samuel Heller, vice-president; John Heller, secretary-treasurer.

Announcement is made that P. J. Flaherty, president and general manager, has purchased the Johnson interests of the Johnson Bronze Co., New Castle, Pa. No change is contemplated, either in operation or personnel, Mr. Flaherty continuing as president and general manager.

The Parker Wire Goods Co., of Worcester, Mass., has purchased the plant of the Stephen Richards Co., Inc., at Southbridge, Mass. The manufacture of cutlery will be continued at the latter plant but all sales and shipments will be made from the Worcester headquarters.

The Moltrup Steel Products Co., of Beaver Falls, Pa., announces the establishment of its own branch office in Philadelphia, at 617 Widener Bldg., in charge of Russell E. Crank, district manager. The former representation of Henry Stewart & Co. has been discontinued.

The Smith Co., of Milford, Mass., manufacturer of automobile accessories, has acquired a factory site at Hartford, Conn., and has plans for the immediate construction of a plant to manufacture a new safety control device for automobiles. It is the invention of Robert Smith, president of the company.

Announcement has been made that production of aircraft engines will be commenced in Ottawa, Ontario, Canada, within a few weeks by the Armstrong-Siddeley Motors, Ltd., operating in association with the Ottawa Car Manufacturing Co. Decision to start operations in Ottawa has come at the end of two years' investigation on the part of the company, which has had both its managing director and its production manager in the Dominion.

At the annual meeting of the board of directors of the Keystone Forging Co., of Northumberland, Pa., J. F. Naylor was elected president. He succeeds J. J. Axlirod, who severed his connection with the Keystone Forging Co. last April. Mr. Naylor has been works manager for the past three years, and prior to his connection with the Keystone Forging Co., was with the J. H. Williams Co., at Brooklyn, N. Y., for twenty years.

At the annual directors meeting of the W. A. Jones Foundry and Machine Co., of Chicago, several changes were made in personnel of the officers. The following will now direct the affairs of the company: Warren G. Jones, president; George W. Page, vice-president; Wm. F. Coleman, treasurer; John A. Sizer, secretary. G. W. Page, who assumes the position of vice-president, has been with the company for almost 30 years and is director of purchases. Wm. F. Coleman the new treasurer is an old employee of the company and also holds the position of General Superintendent.

Obituaries

GEORGE BERGMAN, for the past twenty-six years associated with the Cincinnati Milling Machine Co., and who had been assistant secretary and export manager of the company, died last week in Cincinnati.

FRED H. WALL, advertising manager of the Carlyle Johnson Machine Co., of Manchester, Conn., died in that city on Jan. 19. Mr. Wall was a veteran newspaperman and had been engaged in publicity work for the Johnson firm for several years.

MICHAEL LONGRIDGE, formerly chief engineer of the Engine and Boiler Insurance Co., died on Jan. 18, aged 80. He had been president of the London Institution of Mechanical Engineers, and also of the Manchester Association of Engineers.

Personals

M. B. MATHLEY has been appointed exclusive agent in the Chicago territory for the Roller-Smith Co., of New York. He succeeds M. Frankel.

HENRY HUSS has been appointed sales manager of the Putnam Division of the Shaw Crane-Putnam Machine Co., Inc., operated by Manning, Maxwell & Moore, Inc.

GUY M. PETERSON, of Springfield, Mass., was elected vice-president of the Cheney-Bigelow Wire Works, of that city, at a recent meeting of the board of directors.

HERBERT G. WILLIAMS, secretary of the Machine Tool Trades Association, London, has been appointed parliamentary secretary to the British Board of Trade.

F. A. LAWLER, formerly manager of the Chicago branch of the Crucible Steel Co. of America, has been appointed executive vice-president of the Ziv Steel and Wire Co., of Chicago.

T. HAROLD KINKADE, field service engineer for the Wright Aeronautical Corporation, of Paterson, N. J., will resign that position shortly and will move to California where he will establish an air service station in the neighborhood of Los Angeles.

MORTON J. REED has purchased all stock held in the Hooker Manufacturing Co., St. Johnsbury, Vt., and will continue to conduct the business under the name of the Hooker-Reed Co. The company was founded more than 100 years ago.

W. R. G. BAKER has been appointed managing engineer of the radio department of the General Electric Co. Mr. Baker succeeds Adam Stein, Jr., who has joined the executive staff of the Acoustics Products Co., a holding company recently organized to take over a number of radio phonograph companies.

CHARLES J. RHODES, president of Joseph Rhodes & Sons, Wakefield, England, manufacturers of metal-working machinery, has interested a prominent Montreal financial group in joining him in establishing a factory at Longueuil, Montreal, to manufacture his patent presses with deep-draw attachments; also his deep-draw presses, automatic stagger presses, and other metal-working machinery. The Canadian company has been formed under the name of Rhodes (Canadian) Ltd.

Calendar of Local Meetings

National Association of Cost Accountants

Baltimore Chapter. April 17. Subject: "The Budget in Manufacturing—Application of Budgetary Principles and Their Performance."

Boston Chapter. April 26. Subject: "Cost and General Accounting Procedure for a Paper Mill," by Homer A. Sargent.

Buffalo Chapter. April 26. Hotel Buffalo. Subject: "Debatable Questions in Industrial Accounting." By Clarence S. Marsh.

Cincinnati Chapter. April 17. Subject: "Accounting for Value of Fixed Assets," by H. G. Baldwin.

Chicago Chapter. April 19. Subject: "What the Sales Department Wants From the Accountant," by V. Frank Banta.

Cleveland Chapter. April 18. Subject: "Accounting in the Rubber Industry."

Detroit Chapter. April 19. Subject: "Inventory—Practical Methods of Control."

Hartford Chapter. April 17. Plant Visitation, Stanley Works, New Britain, Conn.

Indianapolis Chapter. April 18. Subject: "Cost Reports and Their Use by Foremen, Superintendents and Managers," by H. A. Bullis.

Los Angeles Chapter. April 24. Subject: "Shop Accounting for Public Garages," by C. E. Hoover.

Forthcoming Meetings

American Society for Steel Treating. Semi-annual meeting, Montreal, Canada, Feb. 16 and 17, 1928. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland.

American Institute of Mining and Metallurgical Engineers. Annual meeting of the Institute of Metals Division, Engineering Societies Bldg., New York City, Feb. 20 to 23. H. Foster Bain, secretary, 29 West 39th St., New York.

National Safety Council. Mid-West Safety Conference, Chicago, March 18. A. A. Mowbray, director of publicity, 108 E. Ohio St., Chicago.

American Gear Manufacturers' Association. Twelfth annual meeting, Rochester, N. Y., April. Details later. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

American Welding Society. Annual meeting, week of April 23, New York City. M. M. Kelly, secretary, 33 West 39th Street, New York City.

American Railway Association. Schedule of sectional meetings: Division IV, Engineering, March 6 to 8, Chicago Division V, Mechanical, June 13 to 20, Atlantic City, N. J.; Division VI, Purchases and Stores, June 13 to 15, Atlantic City, N. J.

National Metal Trades Association. Thirtieth annual meeting, Hotel Astor, New York, April 25 and 26. J. E. Nyham, secretary, Peoples Gas Bldg., Chicago, Ill.

National Foreign Trade Council. Fifteenth anniversary convention, Houston, Texas, April 25, 26 and 27. O. K. Davis, secretary, India House, Hanover Square, New York.

American Foundrymen's Association. Convention and Exhibit, Philadelphia, May 14 to 18. Technical Sessions at Hotel Belleview-Stratford; exhibit at Commercial Museum. R. E. Kennedy, secretary, 140 So. Dearborn St., Chicago.

National Association of Purchasing Agents. Annual meeting and "Informashow," Kansas City, Mo., May 28 to 31. W. L. Chandler, secretary, 11 Park Place, New York.

Association of Iron and Steel Electrical Engineers. Annual meeting, Stevens Hotel, Chicago, June 25 to 29. J. F. Kelly, managing director, Empire Bldg., Pittsburgh, Pa.

American Society for Testing Materials. Annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 25 to 29. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia, Pa.

Society of Automotive Engineers. 1928 Summer Meeting, Chateau Frontenac, Quebec, Canada, June 26 to 29. C. E. Heywood, in charge of meetings, 29 West 39th St., New York.

American Railway Tool Foremen's Association. Annual meeting, Hotel Sherman, Chicago, Sept. 12, 13 and 14. F. A. Armstrong, secretary, 564 W. Monroe St., Chicago.

American Railway Tool Foreman's Association. Sixteenth annual convention of the Supply Association, Hotel Sherman, Chicago, Aug. 29 to 31. F. A. Armstrong, secretary, the Pratt & Whitney Co., 564 W. Monroe St., Chicago.

American Society for Steel Treating. "National Metals Exposition," Commercial Museum, Philadelphia, Pa., week of Oct. 8 W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

STRUCTURAL shapes, plates, and soft steel bars hold at last week's rate of $1.85 per 100 lb., Pittsburgh, in carloads. The trend in steel is definitely upward and is supported by increasing demand. Comparisons with year-ago levels show that many of the principal shop materials and supplies have not changed in price. Steel rails, for instance, hold at $43 per ton base, Pittsburgh, established in October, 1922. Steel pipe and tin plate are practically in a class with rails, in that they have shown only one price change (a decline) since April, 1923. Soft-steel bars in small lots at New York warehouse and abrasives, are at prices that obtained in the week of Feb. 9, 1927.

(All prices as of Feb. 3)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b:

CINCINNATI	
No. 2 Southern	$21.44
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	16.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	21.26
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.80
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities rom warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10@2.20	3.50	3.25	3.89
No. 12	2.15@2.25	3.55	3.30	3.94
No. 14	2.20@2.30	3.60	3.35	3.99
No. 16	2.30@2.40	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.70@2.80	3.75	3.55	4.00
No. 22	2.85@2.95	3.90	3.70	4.15
No. 24	2.90@3.00	3.95	3.75	4.20
No. 26	3.00@3.10	4.05	3.85	4.30
No. 28	3.15@3.35	4.20	4.00	4.45
Galvanized				
No. 10	2.95@3.05	4.10	3.80	4.25
Nos. 12 to 14	3.05@3.15	4.20	3.90	4.35
No. 16	3.15@3.25	4.30	4.00	4.45
No. 18	3.30@3.40	4.45	4.15	4.60
No. 20	3.45@3.55	4.60	4.35	4.75
No. 22	3.50@3.60	4.65	4.40	4.80
No. 24	3.65@3.75	4.80	4.50	4.95
No. 26	3.90@4.00	5.05	4.75	5.20
No. 28	4.15@4.25	5.30	5.00	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness — Decimal	B.w.g. and Fractions	Outside Diameter in Inches ⅛	¼	⅜	½	1	1¼	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	....	4.65
Spring steel, heavier	4.00	....	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	5.70	6.10
Floor plates	5.25	5.30	5.00
Cold drawn, round and hex.†	3.30	3.65	3.60
Cold drawn, flats and squares	3.80	4.15	4.10
Structural shapes	3.34	3.00	3.10
Soft steel bars	3.24	3.00	3.00
Soft steel bar shapes	3.24	3.00	3.00
Soft steel bands	3.99	3.65	3.65
Tank plates	3.34	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, 3/32, 8.35c.; 1/8, 7.85c.; 5/32 to 1/2 7.35c. per lb. *Flat, 3/16@1/4-in. thick. †Also shafting and screw stock.

METALS

Current Warehouse Prices in Cents Per Pound for Small Lots

Copper, electrolytic, up to carlots, New York	15.37½		
Tin, pigs, 5-ton lots, New York	55.87½		
Lead, pigs, up to carlots, E. St. Louis	6.25	New York	7.10
Zinc, slabs, up to carlots, E. St. Louis	5.65	New York	6.57½

	New York	Cleveland	Chicago
Antimony, slabs, ton spot	13.50	14.00	14.25
Copper sheets, base	22.75	22.75	22.75
Copper wire, base	19.37½	19.37½	15⅝@15⅞*
Copper bars, base	22.25	22.25	22.25
Copper tubing, base	24.50	24.50	24.50
Brass sheets, high, base	18.75	18.75	18.75
Brass tubing, high, base	23.62½	23.62½	23.62½
Brass rods, high, base	16.50	16.50	16.50
Brass wire, high, base	19.25	19.50	19.25

*Mill

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	24.30	26@27	26.02
Zinc sheets (casks)	11.00	12.65	10.36
Solder (½ and ½), (case lots)	35.00	37.50	¾4@38

Babbitt metal, delivered, New York, cents per lb.:

Genuine, highest grade	72.00
Commercial genuine, intermediate grade	61.00
Anti-friction metal, general service	31.50
No. 4 babbitt (f.o.b.)	12.50

Nickel, f.o.b. refinery, cents per lb.:
Ingots..... 35.00 Electrolytic.. 37.00 Shot.....36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	45.00
Cold drawn rods, Grade "A" (base)	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	28.00	Hot rolled rods (base)	35.00
Blocks	28.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible copper	12.25 @12.50	11.50	11.00@11.50
Copper, heavy, and wire	11.50 @12.25	10.75	10.25@10 75
Copper, light, and bottoms	10.00 @10.50	9.50	9.25@ 9.75
Heavy lead	5 12½@ 5.37½	5.25	4.75@ 5.25
Tea lead	4.25 @ 4.50	3.75	4.00@ 4.50
Brass, heavy, yellow	7.12½@ 7.37½	7.25	7.00@ 7.50
Brass, heavy, red	9.00 @ 9.50	9.75	9.00@ 9.50
Brass, light	5.50 @ 6.00	5.75	6.00@ 6.50
No. 1 yellow rod turnings	7.25 @ 7.75	7.50	7.00@ 7.50
Zinc	3.25 @ 3.50	3.25	2.50@ 3.00

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
Coke Plates—Prime—Per box				
100-lb.,	14x20	6.10	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	.12	.12@.17
Wiping cloths, washed white, per lb	.15½@17½	36.00 per M	.15
Sal soda, per lb	.02	.02	.02½
Roll sulphur, per lb	.027	.03½	.04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots	.76½	.86	.78
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	.65	.50	.50
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.	.27	.35	.26
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
(Leather—List price, 24c. per lin. ft. per inch of width for single ply.			
Medium grade	35%	35%	35%
Heavy grade	30%	30%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	45%	50–10%	50%*
Second grade	50%	60–5%	50–10%†

*Large quantities, 60%. †Large quantities, 60-10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.033	.033	.04
Brass rods	per lb.	.165	.165	.1587½
Solder (½ and ½)	per lb.	35	.3675	.4012½
Cotton waste, white	per lb.	.10@13½	.10@.13½	.13@.17½
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3 10	3.10	3.10
Lard cutting oil	per gal.	.65	.65	.55
Machine oil	per gal.	.27	.27	.33
Belting, leather, medium	off list	35%	35%	40-5%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper	$5.40	$4.95	$5.13
*Emery paper	10.71	9.15	10.71
*Emery cloth	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper	1.29	1.27	1.32
Cloth	3.10	3.05	3.05
Fire clay, per 100 lb. bag	...	.75	.75
Coke, prompt furnace, per net ton		Connellsville,	2.65@3.00
Coke, prompt foundry, per net ton		Connellsville,	3.75@4.50
White lead, dry or in oil	100 lb. kegs	New York,	13.75
Red lead, dry	100 lb. kegs	New York,	13.75
Red lead, in oil	100 lb. kegs	New York,	15.25

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in	55%
Larger up to 1 x 30-in	50%
1¼ and 1¼ in. dia	35%
Carriage bolts:	
Up to ½ x 6-in	55%
Larger sizes	50%
Coach and lag screws:	
Up to ½ x 6-in	55%
Larger sizes	50%
Tap bolts, hexagonal heads	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in., incl	55%
Semi-finished, hexagonal, tapped, in packages, all sizes	40%
Case hardened, hexagonal, tapped, in packages, all sizes	30%
Washers: Deduct from list, per 100 lb	$3.50*
Rivets, button and cone head:	
Small, including ⅛-in. dia	50-10%
Large (base) per 100 lb. net	$5.00†

Note—For less than case or keg quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.

*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

D. C., Washington—D. C. Commissioners —will receive bids until Feb. 20 for foundry and forge shop equipment for McKinley Technical high school.

Mass., North Attleboro—Universal Car Co., South Main St.—miscellaneous tools and equipment for proposed garage and repair shop. Estimated cost $45,000.

Mass., Somerville (Boston P. O.) — Samuel Marshall, Inc., 43 Tremont St., Boston — miscellaneous tools and equipment for proposed garage and repair shop at Broadway and Medford St., here. Estimated cost $100,000.

Mo., St. Louis—Cord Storage & Moving Co., 5740 Easton Ave.—planing cut off saw.

Mass., Watertown (Boston P. O.) — Watertown Electric Co., 7 Main St.,—miscellaneous tools and equipment for proposed 2 story, garage and repair shop on North Beacon St. Estimated cost to exceed $50,000.

Mich., Detroit — F. J. Lamb Co., 6343 Wight St., F. J. Lamb, Pres. (toolmakers)—equipment for machine shop.

Mich., Detroit—Vinco Tool Co., 7350 Central Ave.—grinder for general use.

Mo., St. Louis—St. Louis-San Francisco Ry., Frisco Bldg., Ninth and Olive Sts., B. T. Wood, Purch. Agt., will receive bids until Feb. 20 for one Niles combination journal truing and axle lathe complete with crane and three carriages including burnishing tools and motor; one Putnam 90 in. heavy duty driving wheel lathe and motor; one Warner & Swasey No. 4-A Universal hollow hexagon turret lathe, 25 in. swing 4¼ in. bar complete with equipment and motor; one F. F. Micre Internal grinder complete with two sets grinding wheel, Allis-Chalmers motor, 5 hp., 1,160 r.p.m., 440 v., 3 hp. 60 cycle without base or pulley, also 2 hp. Allis-Chalmers A.R., motor 1,750 r.p.m., Westinghouse, General Electric or Wagner motors fitted with Timken bearings, starter for both motors to be Allen-Bradley type starting switch complete with push button stations; one Leeds-Northrup recording pyrometer and temperature control; one No. 220 Jarecki pipe threading machine ¼ to 2 in. capacity complete with set of dies and extra dies including one set 1 in. one set 1¼ in. and one set 2 in. left hand direct connected to motor; one No. 8 metal band saw complete with motor and six extra blades for cutting plate and structural steel shapes; one 24 in. heavy pattern American automatic oiled Vee Ram crank shaper, single pulley belt drive with all steel double screw vise; one Niles-Bemont-Pond inclined type 96 in. 600 ton driving wheel press and motor; three cyclone 5 ton high speed chain hoists; two No. 8071 wood boring motor, Independent Pneumatic Tool Co.'s No. 62; one 100 ton spring testing machine, one Pels power punch and shear, Lusef 30 in. throat motor driven and two 5021-A automatic temperature controller Thermocouple type complete.

Mo., St. Louis—Utility Tool & Mfg. Co., 620 Tower Grove Ave.—No. 4 milling machine with vertical head.

O., Columbus—R. B. Clark Tire Co., 664 North Fourth St., R. B. Clark—complete equipment including two electric drills, one heavy press, one air compressor, etc., for service station.

O., Columbus—St. Louis Cutting Die Co., 457 Ludlow St., P. Muskoff, Mgr.—general equipment including two grinding machines, three emery wheels, etc., for branch plant.

Ore., Eugene — Southern Pacific Co., 65 Market St., San Francisco, Calif., F. W. Mahl, Gen. Purch. Agt.—two large electric cranes for proposed 200 x 200 ft. machine shop here. Estimated cost $200,000.

Tex., Cleburne—Atchison Topeka & Santa Fe Ry. Co., 80 East Jackson Blvd., Chicago, Ill., M. J. Collins, Purch. Agt.—list of machine tools and equipment for proposed shops here.

Opportunities for Future Business

Calif., Compton — Alco Oil Tool Co., Avalon Blvd., has work under way on a 60 x 186 ft. addition to plant including 35 x 70 ft. welding shop, 35 x 180 ft. garage, etc. at 16516 Avalon Blvd. Estimated cost $50,000. Work will be done under the supervision of A. R. Eaton.

Calif., Riverside—U. S. Government, W. C. Gardenshire, March Field, is receiving bids for the construction of a group of building including administration building, hangars, radio and shop building, etc. Estimated cost $2,000,000. Private plans.

Calif., South San Francisco — Pacific Coast Steel Co., Rialto Bldg., San Francisco, is having plans prepared for the construction of a factory for the manufacture of nuts, bolts, rivets and various types of hardware. Estimated cost $500,000.

Calif., Torrence — Dohney-Stone Drill Corp., Los Angeles, will build a 1 story, 180 x 360 ft. factory including garage, blacksmith shop, etc. here. Estimated cost $250,000. Hamm, Grant & Brunner, 607 Ferguson Bldg., Los Angeles, Archts.

Conn., Hartford—Smith Co., R. Smith, Pres., Milford, Mass., manufacturers of automobile accessories, plans the construction of a factory here. Estimated cost $40,000. Architect not selected.

Ill., Chicago — Samuel Olson Co., 2418 Bloomingdale Ave., manufacturers of conveyors, is receiving bids for a 1 and 2 story, 135 x 260 ft. factory and office on Kostner Ave. Estimated cost $150,000. The Walter Co., 510 North Dearborn St., Archt. Noted Oct. 17.

Ind., Indianapolis — Parts Corp., 733 Virginia Ave., is having plans prepared for a 2 story, 35 x 225 ft. factory for the manufacture of automobile parts. Estimated cost $60,000. Foltz, Osler & Thompson, Wild Bank Bldg., Archts.

Ind., Marion—Craftsman Tool Co. is having plans prepared for the construction of a factory. Estimated cost $41,000. Private plans.

Ind., Marion—Western Oil & Refining Co., 310 North Meridian St., Indianapolis, is having plans prepared for a 1 story machine shop and battery service station here. Estimated cost $42,000. Bishop-Knowlton-Carson, 312 North Meridian St., Archts.

Ky., Louisville—J. Graham Brown, Fourth St. and Broadway, plans the construction of a 4 story, 212 x 300 ft. bus depot including garage, etc. at Fifth St. and Broadway. Estimated cost $400,000. P. J. Bradshaw, International Life Bldg., St. Louis, Mo., Archt.

La., New Orleans—Bd. of Comrs. of Port of New Orleans, awarded contract for a 2 story repair shop and office. Estimated cost $128,510.

Md., Baltimore—Mayor and City Council, City Hall, will soon award contract for a 3 story warehouse and repair shop at 29th and Curtain Sts. W. F. Stone, Jr., Munsey Bldg., Archt.

Mass., Boston—Charles St. Garage Corp., L. K. Morse, Pres., 252 Cambridge St., plans the construction of a 2 story repair and service garage. Estimated cost $50,000. Architect not selected.

Mass., Springfield—Fort Realty Co., c/o H. C. Hearne, 1389 Main St., Archt., will receive bids until Feb. 15 for a 3 story, 110 x 140 ft. garage and repair shop at Columbus Ave. and Fort and Hampden Sts.

Mich., Grand Rapids—Superior Foundry Co., c/o Wernette-McCarthy, Houseman Bldg., Archts., awarded contract for the construction of a foundry.

Mich., Pontiac—Oakland Motor Car Co., Oakland Ave., awarded contract for a 2 story engineering building and garage. Estimated cost $150,000.

Mich., Selfridge Field (Mt. Clemens P. O.) —Constructing Quartermaster, U. S. Government, is having plans prepared for warehouse, shops, hangars, etc. Estimated total cost $458,000. J. A. Wetmore, Washington, D. C., supervising architect.

Mo., Kansas City—Scarritt Estates Co., 231 Scarritt Bldg., awarded contract for a 1 story, 170 x 230 ft. sales and service station. Estimated cost $100,000. Private plans.

Mo., St. Louis—Independent Plumbing & Heating Supply Co., 1119 Chestnut St., will build a terminal, and warehouse including two loading platform, etc. at 3340 Market St. Estimated cost $125,000. D. R. Harrison, 1106 Ambassador Bldg., Archt.

N. Y., Brooklyn—The Decorated Metal Mfg. Co., Sackett and Henry Sts., had plans prepared for a 6 story factory and warehouse. Estimated cost $40,000. Slee & Bryson, 160 Montague St., Archts. Noted Aug. 25.

N. Y., Brooklyn——New York Dock Co., D. L. Lilly, V. Pres., 44 Whitehall St., New York, had plans prepared for a 3 story addition to factory at Wharf and Joralemon Sts. Estimated cost $40,000. L. E. Driver, 334 Furman St., Archt.

N. Y., Buffalo—General Drop Forge Co., 1728 Elmwood Ave., is having plans prepared for a 1 story foundry and machine shop. Estimated cost $125,000. E. McGeorge, 3030 Euclid Ave., Cleveland, O., Archt. and Engr.

N. C., Charlotte—J. H. Wearn & Co., 308 East Trade St., awarded contract for first unit of woodworking shop. Estimated cost $150,000.

O., Canton—Zeigler Tire & Supply Co., is having plans prepared for a 1 story, 60 x 127 ft. service station at Tuscarawas St. and Maryland Ave. Estimated cost $50,000. Private plans.

O., Cleveland — The Steel Improvement Co., C. H. Smith, Pres., 5003 Windsor Ave., is receiving bids for a 1 story, 60 x 220 ft. forge shop. Estimated cost $100,000. Private plans. Noted Jan. 26.

Pa., Philadelphia—Norton Co., 3208 Market St., manufacturers of grinding wheels, will soon award contract for a 2 story, 57 x 100 ft. service building, warehouse, etc. at Stanton and London Sts. Ballinger Co., 12th and Chestnut Sts., Archt.

Pa., Pittsburgh—Dravo Contracting Co., Neville Island, will build a 1 story, 125 x 200 ft. manufacturing building. Estimated cost $40,000.

R. I., Cranston—City Lease & Building Co., c/o G. B. Long, 470 Atlantic Ave., Boston, awarded contract for a garage, warehouse, etc. at Harris and Weston Aves. Estimated cost $750,000. Private plans. The Great Atlantic & Pacific Tea Co., Somerville, Mass., lessee.

Tex., San Antonio—J. J. Nix, c/o Lanier Hotel, plans the construction of a 13 story, 130 x 180 ft. hotel and garage including machine shop, etc. at Navarro and College Sts. Estimated cost $1,850,000. H. T. Phelps, c/o Hicks Bldg., Archt.

Wis., Milwaukee—Metropolitan Investment Co., 290 3rd St., plans the construction of a 2 story, 60 x 200 ft. garage at State and Third Sts. Estimated cost $150,000. Architect not selected.

Que., Montreal—J. Patenaude, Theatre Francais, St. Catharine St. E., plans the construction of a garage and service station on St. Dominique St. Estimated cost $150,000.

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How Nash Uses Conveyors in the Cylinder Shop

WHEN the Nash Motors Company needed a new and larger building to house its cylinder department, two considerations were given mature thought before the plans were arranged. One was the possible future expansion of business, anticipated in view of past increases, and the other was to devise a layout in which manual labor in transporting materials would be eliminated in so far as possible. Both of these matters have been well taken care of in the building to be described, which is located at the Kenosha, Wis., plant, where the advanced-six models are built.

The building as shown in the layout in Fig. 1, measuring 550 ft. in length and 70 ft. in width, is arranged so that cylinders are started at one end, in the rough condition, and travel in a straight path to the opposite end, where the final inspection is made. Such a layout has many features, perhaps the outstanding one of which is the elimination of back-tracking. The cylinder line, arranged so that it covers one half of the building, is 30 ft. in width, adjacent to a 10-ft. aisle, while the other half of the building is vacant, with the exception of a temporary office, tool crib and cutter-grinding department, which can be removed at short notice. This arrangement permits a duplicate of the cylinder line to be equipped when production demands warrant.

At present, the output capacity is 350 cylinders per day, so that with a new line, and if necessary, an additional shift, the production can be doubled or even trebled.

Cylinder heads and bearing caps are also made in the cylinder department, as these units form parts of the cylinder-block assembly, and it is logical to manufacture them in the same department, or as close by as possible, so that a better and constant check on interchangeability can be made. Inasmuch as the crankcases are integral parts of the cylinder blocks, the bearing caps are fitted, babbitted and bored in place before the cylinder blocks leave the department.

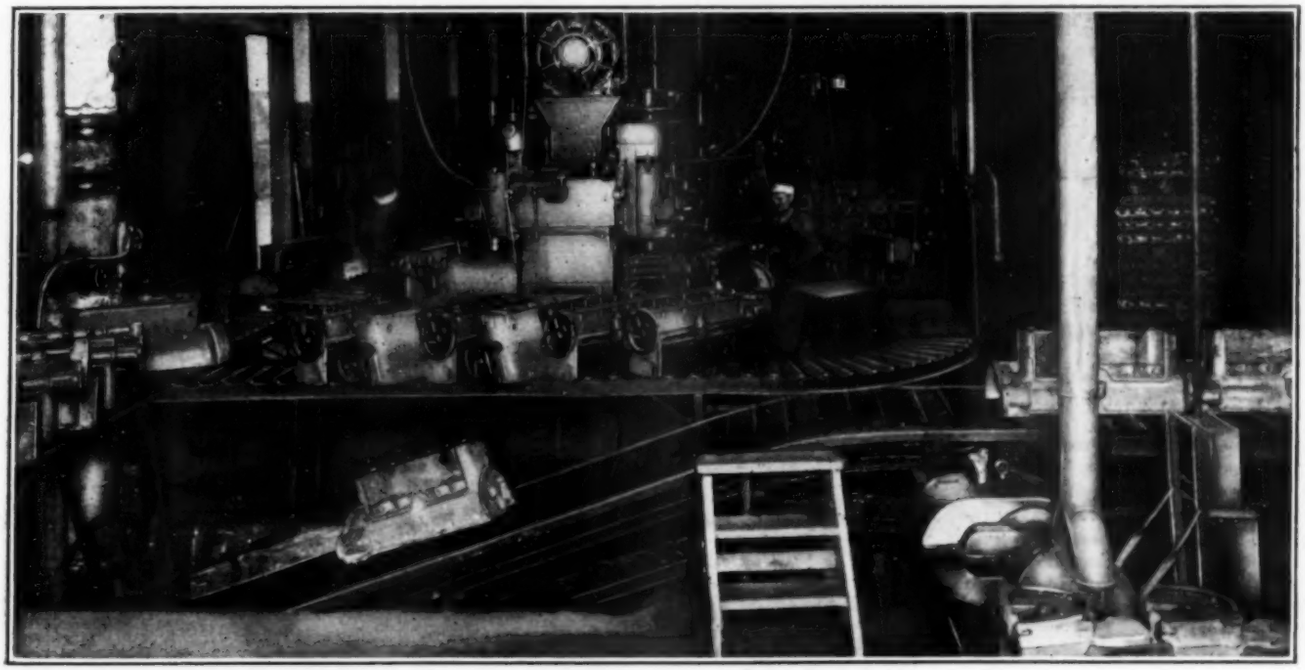


Fig. 2—An underground passage connecting the foundry and the cylinder block department, eliminates manual transportation between these two points. After the cylinder blocks arrive in the shop, they travel on a conveyor, passing the main aisle and two side walls, thus allowing space for a small amount of reserve stock. The space on the conveyor serves for additional storage, accommodating 600 cylinder blocks

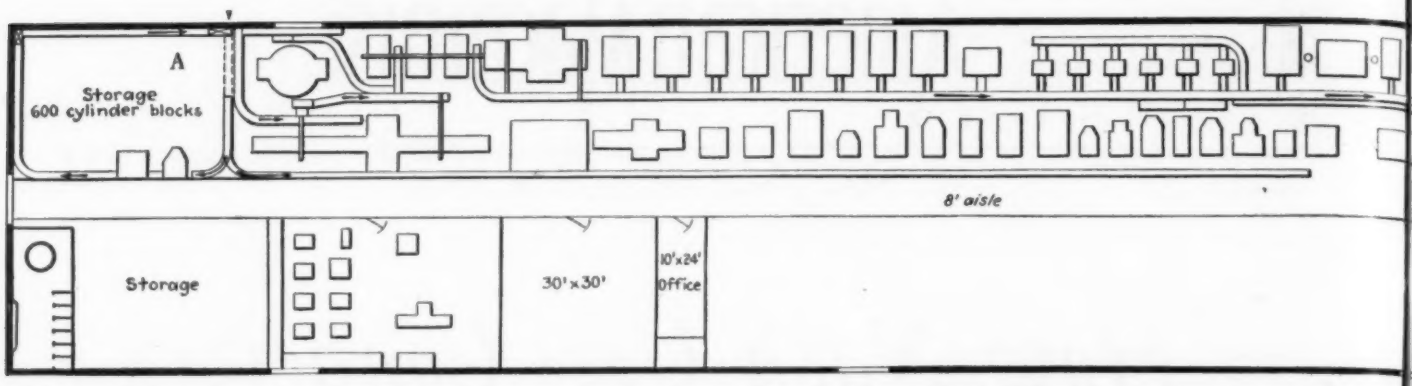


Fig. 1—Floor plan of the cylinder block shop, showing length and 70 ft. in width, and is arranged so that an

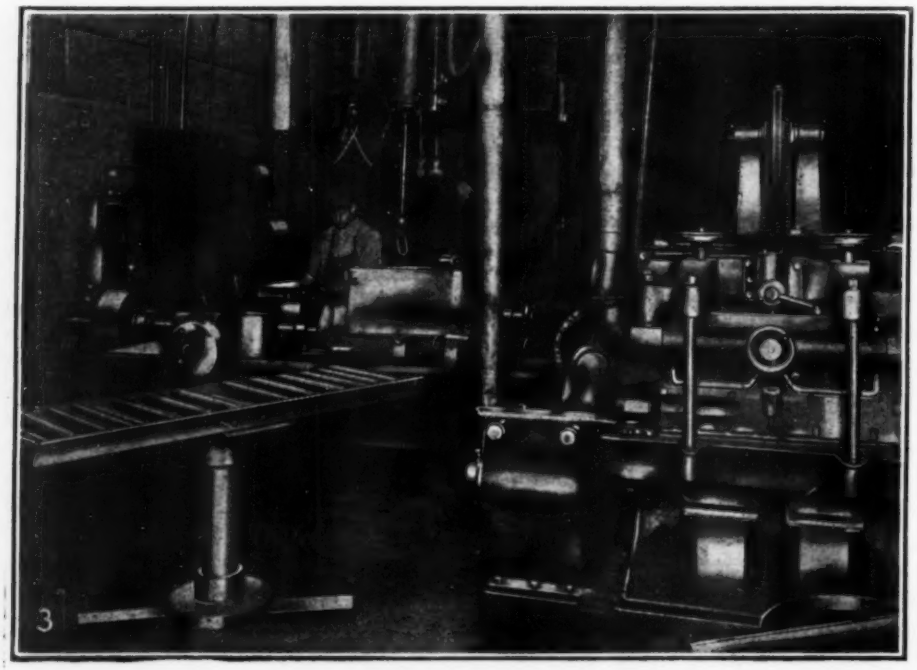
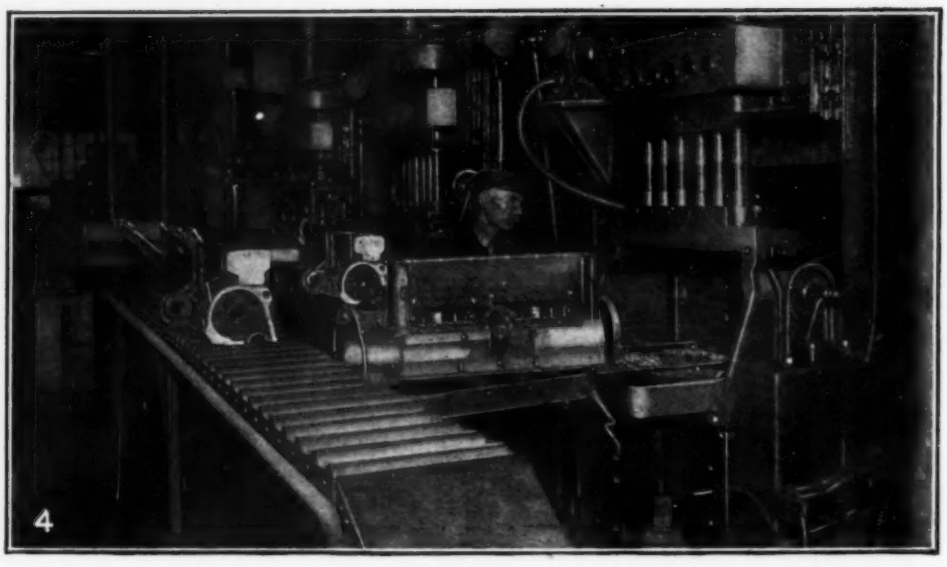
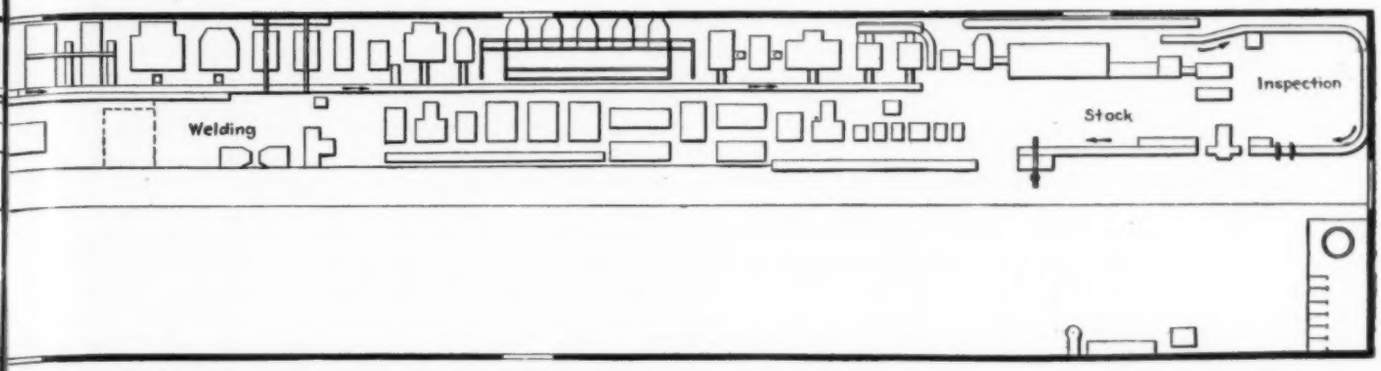


Fig. 3—Turntables and air hoists are used at convenient points to assist in handling cylinder blocks. When a cylinder block has been milled, in the machine shown at the right, it is transferred on the turntable, which in turn is swung around 90 deg., so that the cylinder block can be placed in the boring machine without having to be lifted. From the boring machine the cylinder block is transferred to the next operation by a hoist

Fig. 4 — Cylinder blocks follow a straight course through the shop, so that back-tracking and zigzagging are eliminated. To assist in transferring cylinder blocks from the conveyor to the machines, gates are attached to the conveyor, so that hand lifting is eliminated. The gates are swung out of the way when not in use to avoid blocking the passageway





the conveyor system. The building measures 505 ft. in additional cylinder-block line can be equipped when desired

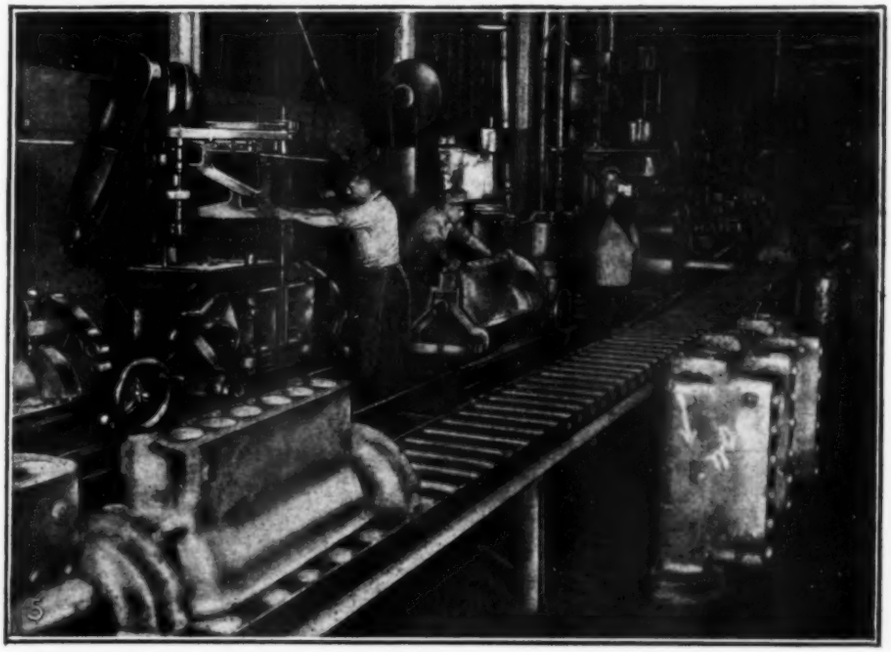


Fig. 5 — For drilling and tapping miscellaneous small holes, for which six machines are used, the cylinder blocks are placed in trunnion jigs, mounted on tracks, so that they can be transported easily from one machine to another. At the end of the line, the jigs are wheeled on a transfer table, and are pushed over to the conveyor, where the cylinder blocks are removed. The jigs then are transferred to a return track for re-use

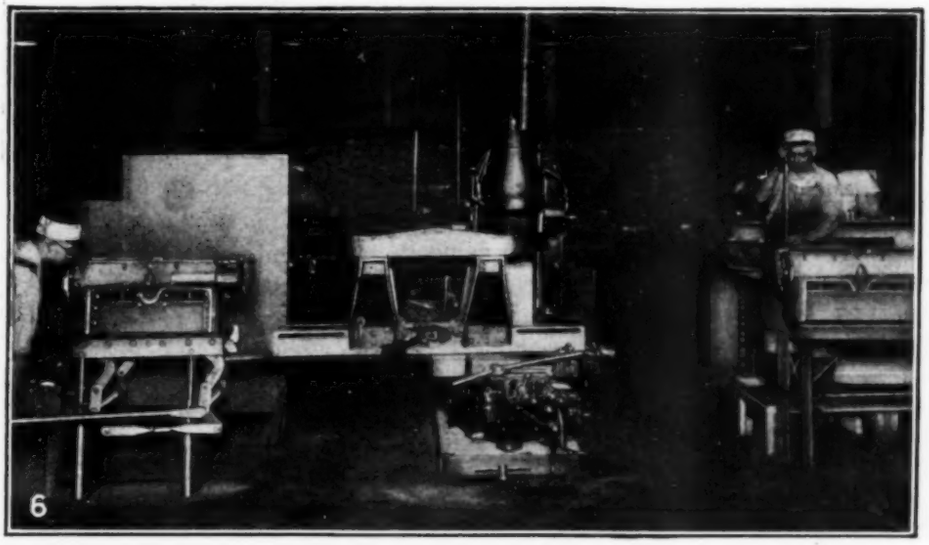


Fig. 6—After cylinder blocks have been washed and inspected, the bearing caps are removed to permit a light cut to be taken on the joint faces. The cylinder blocks are slid from the end of the conveyor, shown at the right, to the milling machine fixture, then after the cut has been made, they are moved to the device shown at the left, which enables them to be lowered to the same plane as that of the conveyor on which final operations are performed

The foundry building, located next to the cylinder department, and separated by a roadway, is arranged so that the final inspection of cylinder castings is made at a point closest to where the cylinder machining starts. These two points are connected by an underground power conveyor, thus eliminating the necessity of manual transportation. The cylinder blocks, received at *A*, Fig. 1, pass around the conveyor shown at the extreme left. The purpose of this arrangement is to form a storage space for reserve work to be placed before the cylinder blocks start down the line. In addition, the floor space within the outer conveyor forms an additional storage space accommodating 600 cylinder blocks.

In Fig. 2 is illustrated the machine shop end of the underground conveyor, and a number of cylinders on the roller conveyor, about to start down the cylinder line. Roller conveyors are utilized throughout the cylinder line, being arranged so that a number of cylinder blocks can be stored on them adjacent to each operation, thus allowing slight flexibility in the handling times. Most of the operations are timed, however, so that the blocks proceed uniformly.

Every effort is made to eliminate hand-lifting or shifting, so that the only progressing to be done by hand is the transporting of cylinder blocks on the conveyors. Air hoists, turntables and gates are placed at convenient points along the line to assist in handling. A turntable used in transferring a cylinder block from a milling machine to a boring operation is shown in Fig. 3. The cylinder block, after being milled, is pushed on to the turntable, which in turn is revolved 90 deg. so that the cylinder block can be transferred, without lifting, to the boring machine, shown at the right. From this machine, the cylinder block is loaded on to the drum-type milling machine, shown at the rear, by an air hoist.

Miscellaneous boring and drilling machines are loaded from the line conveyor by gates, so arranged that they swing out of the way when not in use, to avoid blocking of the passage aisle. One of the gates being used is shown in Fig. 4, while in the rear may be seen two gates thrown back out of the way.

For drilling and tapping miscellaneous holes, the cylinder block is placed in a trunnion jig, mounted on tracks, so that it can be transported to six machines in rotation. A partial view of the layout is shown in Fig. 5. When a jig, of which there are six, reaches the end of the line, the unit is rolled on to a sub-carrier, or transfer table, placed adjacent to the conveyor, from which location the cylinder block is placed on the conveyor by aid of a gate similar to that shown in the previous illustration. The jig is then wheeled down a return track to the starting end, where it is again loaded and put in service.

At the other end of the building, where washing and final inspection are handled, the cylinder block is again passed around on a conveyor located close to the wall, so that a small amount of reserve stock can be stored. At the end of the line, where the bearing caps are disassembled, the joint faces on the cylinder blocks are given a light cut, so that when the caps are again assembled, the crankshaft boring-tool will have sufficient stock to remove, thus producing a true bore. The Kempsmith milling machine used for this operation is illustrated in Fig. 6. When the table is moved to the right, it is at the correct height to enable a cylinder block to be loaded in the fixture. Then, after the cut has been completed, in which case the table will be at the left as shown, the cylinder block is transported to the "lowerator" from which it is lowered to the plane of the next conveyor. From here the cylinder blocks are taken to other machines for a few minor operations and are then loaded on trailers holding 40 units each, and are transported to the assembling department.

The "Other Fellow" Cuts Prices

By Loring Roper

"They're cutting prices something fierce,"
The dealer said to me,
"With just a few exceptions,
Such as Jones and Smith—and me.
The rest are playing pirate
Though their price list is too low
And they're losing lots of money
'Cause they're cutting prices so."

I hear the same tale everywhere,
In every place I go.
They tell me of some other chap
Whose prices are too low.
And everyone points out with pride,
The good ones, two or three,
For there's just a few exceptions
"Such as Smith and Jones—and me."

And every man I interview
Tells me about the same
The other fellow's cutting rates
And ruining the game.
For there's not a man you talk to
But will swear with pep and vim
The only ones who do not cut
Are Jones and Smith—and him.

Allowances for Old Machines

THE Bradbury Gear Works needed new machinery and, as often happens, the manager wasn't sure just what to buy. Through a business acquaintance he had heard of William Holland, unofficial consultant, and had asked him for advice. Mr. Holland had arrived to keep an appointment and the two men were seated in the office of Henry Wilson, general manager of the gear plant, after a stroll through the works. Wilson started the ball rolling.

"We need some new machines to turn gear blanks and we want the best there is, Mr. Holland."

"Didn't I see some Stanley machines in the shop, Mr. Wilson? Haven't they been satisfactory? I know of many shops where the men swear by them."

"They've done well, Mr. Holland. They're the best machines I know of on that job. And their new machines are better yet."

"Then where do I come in, Mr. Wilson? Seems to me you've answered your own question."

"That isn't the whole story, Mr. Holland. It's partly a question of price—and then, too, those Stanley people are very stiffnecked about making us an allowance on these old machines. They only want to allow us scrap value for the old machines and want us to sell them here to save freight. They are certainly worth a lot more than scrap to them."

"I'm not sure that they are, Wilson."

"But there's a lot of work left in them yet, Mr. Holland. Some small shop would get a lot out of them as they are. And if they would just rebuild them a little they could sell them at a good price."

"Sounds reasonable, Wilson, and both statements are probably true. But it *sounds* a lot better than it is, especially from their point of view. Let me tell you how Jim Quinn, general superintendent of the Acme Corporation, sized the same situation up for me just last week. You know he has quite a reputation for having well-equipped shops that turn out work at very low cost."

"Yes," admitted Wilson, "I know him. He's a good man, all right."

"Well," returned his visitor, "here's what he believes. If the machines are still good, it's the job of the owner to find a customer for them. Why should the builder have to assume the cost of selling them, and at the same time perhaps block the sale of a new machine?

"The rebuilding idea isn't so good either. Every manufacturer knows what it does to production costs when he takes that kind of work into his shop. The problem is aggravated in a machine tool plant by reason of the rapid advances in design that are constantly going on. Many of the improvements will not fit the old machines. The cost of rebuilding would be high and on top of that there would be the resale cost."

"But the Brown company offer me a good price for these Stanley machines if I'll switch to their line. If they can afford it surely the Stanley crowd can."

"The chances are, Wilson, that Brown can't afford it. If he allows you more than he gets out of the old machine—and he must count his hauling, freight, storage and selling costs—he is simply cutting prices on his own machine. He may figure it's good business to cut his profit, or even eliminate it, to get you started using his machines. Personally, I agree with Quinn that it's bad business for all hands."

"But I've got to save money where I can, Mr. Holland."

"True—but are you going to save it? You admit that the Stanley machine is the best. You know from your old machines that they are dependable and great producers. If you had no old machines you'd buy Stanley machines without question. But because you've got the notion—and it's a fairly common one—that he ought to make

you a big allowance on the old ones, machines that have paid for themselves many times over, you get peeved and want to switch to Brown machines.

"What you want to remember, and here I'm quoting Quinn once more, is that you are buying *production*, and that personal grudges ought not to be considered. You are virtually asking Stanley to cut his price because you happen to have several of his old machines, on which you have made a good profit for several years.

"The Brown machines may be just as good, but you are taking a chance in swapping. And it isn't a change based on machine performance, but because Stanley has backbone enough to stick to his price.

"I believe that if you were in Stanley's place you'd feel about as he does. And knowing what I do of you, I think you'd take the same stand."

Executives are invited to discuss the problem involved in the foregoing case. Accepted contributions will be paid for.

Discussion

New Equipment Versus Expansion

Brower wanted to expand extensively by adding more mediocre machinery and Old Doctor Holland prescribed intensive expansion by replacing old machines with more modern equipment.

The moral of this episode is that addition to plant should be the last resort of a shop owner; plant growth is justifiable only when existing facilities are beyond intensive development.

Brower appears to have lost his imagination. He should have had catalogs, magazine clippings or manufacturers' quotations on a number of high production tools.—GEO. R. WOODS.

Depreciation Reserves

It seems to me that the first step for Mr. Jones in the solution of this problem would be an individual analysis of every machine in his shop in comparison with new machines of the most modern design. Probably this analysis would show, after a careful consideration of all of the factors involving the replacement of the old machines with new ones and the profits to be obtained as a result of lowered production costs, that it would be advantageous to replace nearly all of his present machines.

As this would require a very large capital, it would probably be necessary to bring these replacements about gradually; that is as the money could be raised for the purchase of new machines. With all of the new machines purchased another analysis should be made.

This second analysis should be made for the determination of the depreciation rate to be included in the machine hour rate. A great deal could be written regarding the many factors affecting this rate, but it depends mainly upon obsolescence and the wearing qualities of the machine, one of which always limits the most profitable economical life of the machine. In any case the depreciation rate on each machine should be made sufficiently large so that at the time when it is estimated that it would become more profitable to replace any particular machine that its salvage value plus the fund accumulated by the depreciation rate would be large enough to purchase a new machine of improved design.

It may be found, however, that it is desirable to replace an old machine much sooner or later than had originally been estimated. This does not warrant changing the depreciation rates unless the reserve fund persists either to increase or decrease over quite a number of years.

To make certain that old machines are not being used that could profitably be replaced, there should be an analysis of each machine made at regular predetermined intervals of, say, one year.

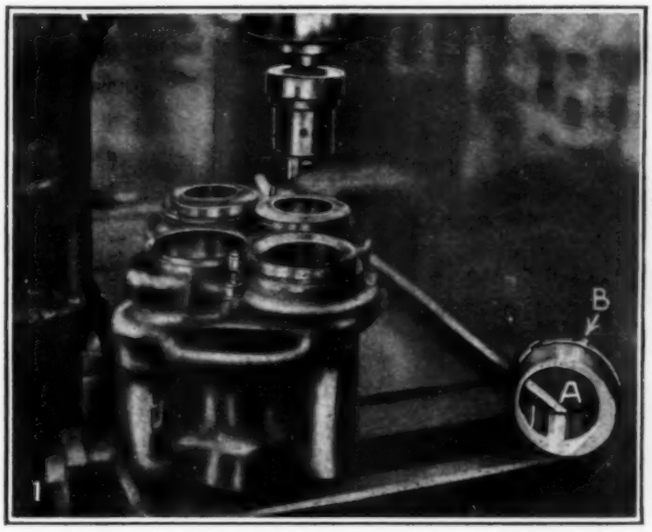
—W. L. ROMICK.

Making Orders Contingent on Swapping Machines

Probably the greatest exponents of swapping were the old horse traders, but their activities had at least one virtue—there was only one man stuck on a given transaction. When it comes to swapping machines, which is virtually what trading orders amounts to, it is very likely that in time both parties will be victims, in that neither will have exactly the machine that is best suited to his particular purposes. The profit on the order so obtained is a single profit, bulking large for the moment, but the slight loss in efficiency, fractional though it is on a single unit of product, is multiplied through the years of active use to which the machine so obtained is put.

Far better would it be to go to the bank if money is tight, and borrow enough to purchase the new machine, or to finance the manufacture of another machine for stock, than to fall into the fallacy of a "mutual" exchange of orders. For the recollection of a swap, a year or two after it has been made and when the loss in production units has multiplied itself, is not a pleasant one.

—W. R. OTTERSON.



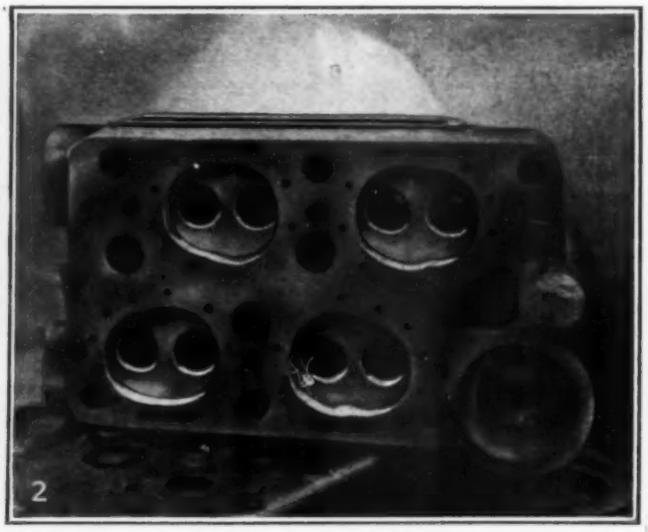


Fig. 1—Fixture for boring combustion chambers. Fig. 2—The combustion side of the cylinder head

Cylinder-Head Operations

By J. A. Lucas

The fact that the cylinder head contains only cast iron simplifies the machining operation that begins with the planing of both faces in lots of eight

THE cylinder heads of the Lancia engine are of cast iron, and the first operations are to machine both the top and bottom surfaces on a Cincinnati planer. The heads are planed in lots of eight by the use of simple fixtures. In the first operation, the head rests on dowels fastened in base plates that are attached to the planer table. These dowels locate on the rough surfaces of the combustion chambers. Small screw-jacks are used directly under the points where the holding-down straps clamp the head to the table, to prevent springing. In the second operation, the heads are located on the surfaces already planed and are clamped directly to the table of the planer. Both operations are done in 20 min. for each cylinder head. Various holes are then drilled in a portable jig, two of the holes being used as locating points for future operations.

The combustion chambers are next machined on the heavy-duty Colburn machines shown in Fig. 1. The jig rests on the planed surface of the combustion chambers and is located by the holes previously referred to. The combustion chambers are not round, but oblong, as shown in Fig. 2. In order to produce this shape, eccentric bushings are used, as shown at *A*, Fig. 1, being located in their proper positions by means of the lugs shown at *B*. Two operations are performed, one for roughing, and the other for finishing. The depth of the combustion chambers is determined by the stop collar above the guide of the boring tool contacting with the bushing in the jig. The combustion chambers are bored in 25 minutes. This includes boring the offset hole.

The next important operation is drilling and reaming the holes for the valve-stem bushings, *A*, Fig. 3. The valve seats are also roughed out at this operation. They can be seen in the oblong combustion chambers, Fig. 2. This operation is divided into four parts. 1. Drilling holes for valve-stem bushings. 2. Reaming the holes. 3. Milling a cylindrical portion of the taper hole, using the previously reamed bushing hole as a guide. 4. Cutting the valve seats, using guides in the cylindrical portions of the seats and in the reamed holes.

The large cylindrical parts of the holes have been found very desirable as guides for reaming and finishing the taper seats. The bushing seats are too small in diameter and too far from the valves to form satisfactory

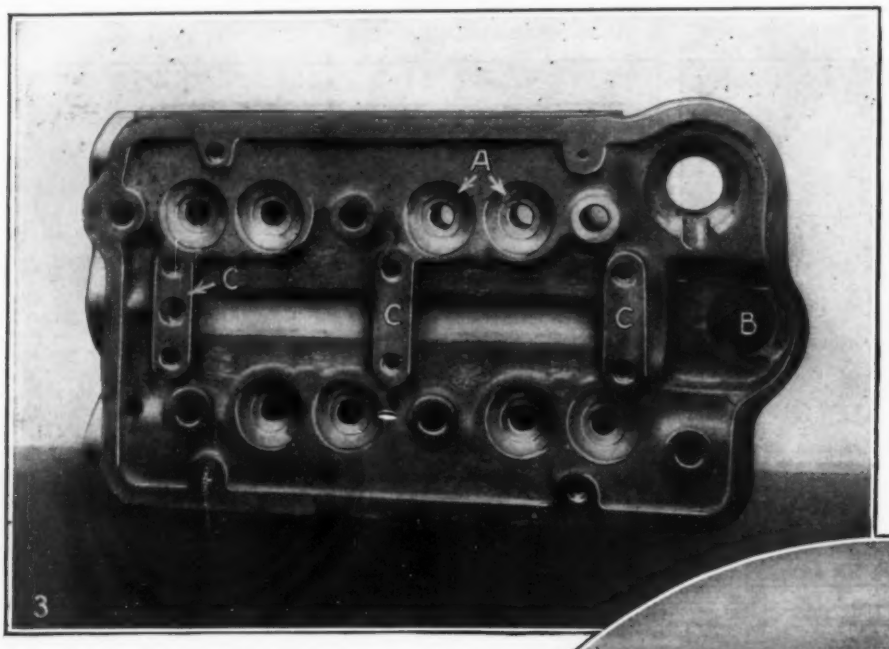


Fig. 3—Upper side of cylinder head, showing the valve-stem bushings, the bored opening for the compensator, and the three pads to which the camshaft bearings are attached. Where the openings to the water jacket have been closed by suitable plugs, is also shown

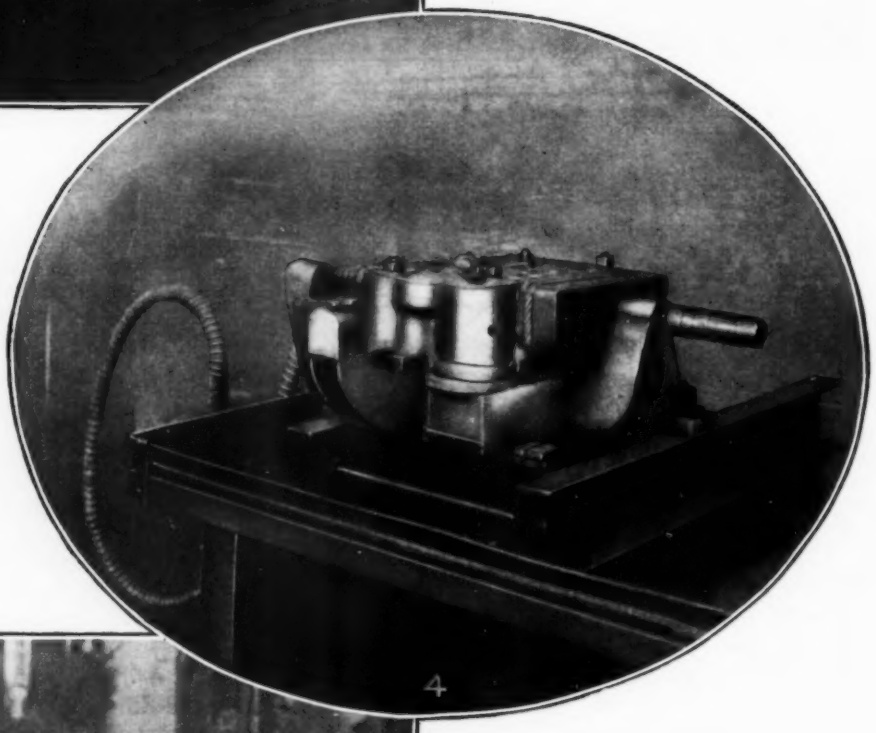


Fig. 4—Fixture for testing cylinder heads under 90 lb. hydraulic pressure. The large pads on the side make it easy to clamp the cylinder heads quickly in place, and so facilitate rapid testing

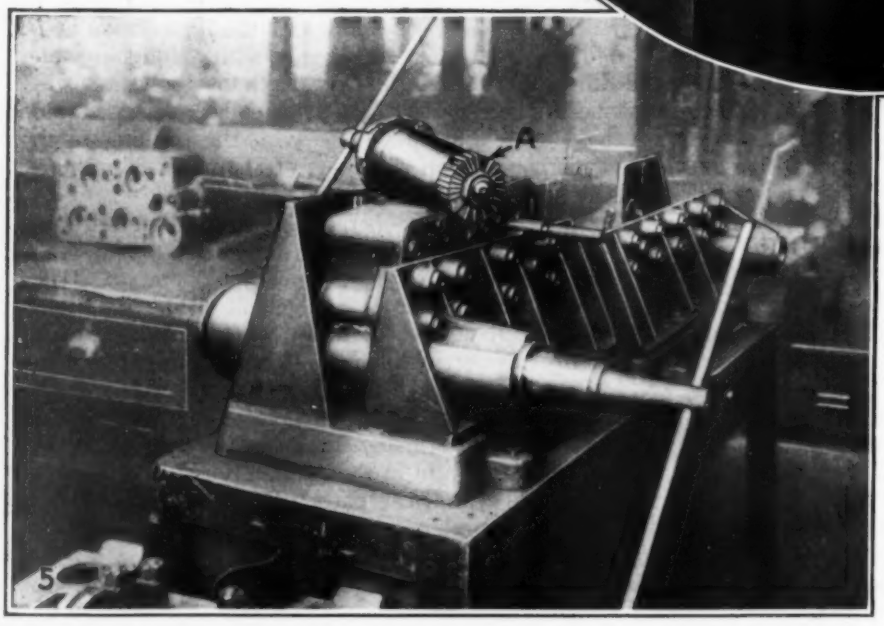


Fig. 5—Fixture for finish reaming the valve-stem guides and other holes in the cylinder heads. This view indicates how the heads are located by the large and small locating bars, and also shows an unevenly spaced reamer on top

guides, the holes being almost as large as the outside diameter of the valves themselves.

A special jig and reamer for this operation are supplied to all service stations and can be secured by owners, if desired.

The upper side of the cylinder head is seen in Fig. 3, the hole at *B* being for what is known as a compensator. This consists of a piston fitting the hole and having a spring beneath it for forcing a roller at the upper end of the piston against a cam on the end of the camshaft. This cam has four lobes and is for producing a continuous strain on the camshaft, contrary to that produced by the combination of the different strains that are taking place at any particular instant. It also keeps a continuous load on the gears that drive the camshaft, and tends to prevent vibration and noise, even when the camshaft becomes slightly worn. The three pads *C* are supports for the camshaft bearings.

After an inspection, the cylinder heads are given a water test of about 90 lb. pressure in the fixture shown in Fig. 4. From here they go to a reaming fixture, Fig. 5, in which the control-shaft bearings are reamed, as well as a number of the other bearing holes. One of the large reamers is shown at *A*. It will be seen that the spacing of the teeth varies gradually, but continuously in one direction. The variation in spacing is to prevent chattering, as would be the case if the teeth

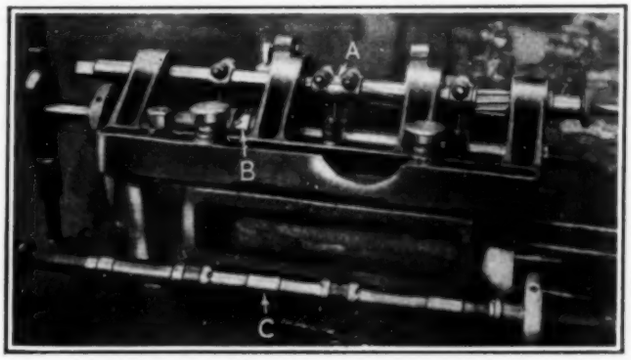


Fig. 6—Reaming and facing the camshaft bearings after they have been fastened in place on the cylinder heads. The fixture affords substantial bearings for supporting the reamers and facing tools

were evenly spaced. The construction of the reaming fixture, and the method of locating the cylinder heads by means of the large and small pins, is rather unusual. This method of irregular tooth spacing is also very different from that used in most shops.

After the three camshaft bearings have been mounted on the cylinder heads, they are finally reamed in the fixture shown in Fig. 6. The reamers are supported in substantial bearings, as at *A*. At the same setting, the sides of the lower bearings are faced, one of the cutters being shown at *B*. One of the bars used for facing the bearings can be seen in front, at *C*. The threaded end is used for feeding the facing cutters into the work to exactly the amount desired.

A tolerance of 0.010 mm. is given as to parallelism of the axis of the two shafts, and plus or minus 0.005 mm. in the diameter.

Is the Buyer at Fault in Today's Industrial Market?—*Discussion*

A Purchasing Agent's Opinion

THE average buyer considers himself shrewd if he is successful in buying a commodity at less than market prices, or below what someone else pays, regardless of whether the price at which he buys yields a profit to the seller or not. If all goods were sold on such a basis, all our industries must fall.

This cannot be construed as shrewd buying, in the broad sense of the term, for every one who markets merchandise is entitled to a reasonable profit. The trouble is selling goods for less than cost, or at a meager profit, is due to poor salesmanship more than to good buying.

I am firmly of the opinion that if every producer of raw materials and every manufacturer of finished products were able to get a fair margin of profit on their products, we would have a healthier and sounder structure in our various fields of endeavor. Business of any kind is predicated upon making money and if we sell real estate, mine ore, manufacture air compressors or prepare food stuffs and wearing apparel for the trade, there must be ample reward for the efforts exerted.

A code of ethics for the purchasing agent would in my opinion be less effective to correct the tendency to squeeze the seller and manufacturer of industrial equipment, than would be an injection of pugnacity and "stick-toitiveness" in the general make up of the salesman.

There will always be expense incurred in selling goods because the basic principles of exchanging goods for money demands this. In our retail stores we have prospective customers who demand that the salesman show them bolt after bolt of dress material, and after inspecting it and taking up the time of the salesman, they walk away without making a purchase. This costs money and cannot be added to the purchase made because none is effected. It has to be borne in the general overhead expense of doing business and corresponds to the time and expense involved by industrial houses when they submit quotations on specifications that are sent them. In the case of articles that require no elaborate specifications or engineering calculations, the expense of making quotations is so slight as hardly to be noticeable and is naturally absorbed in the general item of expense of doing business. But it is another story when elaborate specifications and endless computations are required.

Inquiries for equipment are sent out indiscriminately to every manufacturer without regard for the time and expense involved in making up plans and specifications for that particular job before an estimate can be submitted. Sometimes days and weeks are consumed in preparing bids where considerable engineering and technical knowledge is involved and when this is multiplied by the number of concerns who go over the same ground, the expense is tremendous and the outlay is lost, except to the successful bidder, and then only if he has reserved an adequate amount in his tender to cover this expense.

There is no question but what thousands of dollars worth of engineering calculations is wasted in preparing bids on industrial equipment and can never be reclaimed.

Machining and Measuring Gear Teeth—*Discussion*

SOME statements on page 658, Vol. 67, of the *American Machinist* in the twelfth article under the above title, by Earle Buckingham, have resulted in some interesting correspondence between the author, the editors and H. F. L. Orcutt, of the Gear Grinding Co., Ltd., Handsworth, Birmingham, England. Excerpts from this correspondence are published to indicate the status of the art of gear grinding in at least one plant in England.

In a letter to Mr. Buckingham, Mr. Orcutt writes: "I thought you would be interested to know that we entirely endorse what you say as to the necessity of considering tooth grinding at present, at least as a process where skill and technique cannot be eliminated. For this reason we have from the beginning refused to consider supplying our machines to others or making them for anybody else. I do not say we shall not change this policy when we are further advanced. For the present we hold that it is thoroughly a specialist's job. . . .

"We have now got to a point where we not only can turn out a very high grade gear but it is within sight that we can produce these gears in quantities at a cost probably little in excess of the cut gear, if any. We are in no hurry to exploit the machine side of our business but have something which I consider really in advance of everything ever made in the gear grinding machine.

"This leads me to consider you are wrong when you say that there is a cumulative error between the first and last tooth space ground. This is not true: we have ground thousands and thousands of gears in which it is impossible to find any error in this tooth space due to wear of the wheel. We have long since got over this trouble. If you will permit my saying so, I do not think you have touched the real features of the comparative merits of the formed tooth grinding and the generating.

"I might perhaps mention that the machine illustrated in the article referred to (Fig. 72) is a machine which we scrapped years ago, not because the principles used in this machine were wrong but because the design was a hopeless one. We think it has helped to give a wrong impression of what really can be done on large gear work."

Where the Difference Lies

In reply, Mr. Buckingham states: "As regards wheel wear in grinding gear teeth, if it is present to any appreciable amount, and if the teeth are ground in order, it would seem that obviously the greatest difference would be present between the first and last tooth spaces ground. I have found this condition in many ground gears and index plates which I have measured personally. This applies not only to formed wheel grinding but to flat wheel grinding, etc. In fact, it is usually more apparent on the flat wheel grinding than formed wheel grinding. My object in pointing this out was to call attention to a condition that required careful attention to avoid or minimize.

"On the other hand, with a suitable selection of grinding wheel, depth of cut, grinding speed, feed, etc., it is possible to grind so that the wear on the wheel is so slight that it is less than the other errors of execution. In this case the wear on the grinding wheel has no practical influence, and to all intents and purposes it is nonexistent. Here is where some of the technique of the art must be exercised."

He further adds: "In capable hands, any type of equipment discussed, when properly constructed, will produce excellent results. I did not intend to convey any impression that one type of machine was inherently better than another. Different types of machines introduce different problems to be overcome."

In a later letter to the editors, Mr. Orcutt explains: "If the wheel wears, there will be cumulative error between the last and the first tooth; but the fact is on the finishing cut of all the gears we grind, the wheel does not wear and there is absolutely no difference between the shape of the first and the last tooth ground due to wear of the wheel. This is a very important detail. To do this we have been through a tremendous lot of experimental, research and practical work."

Engineering Service in Design

A UNIQUE engineering service to machinery designers is now being supplied by the Power Transmission Association, of Philadelphia, through a board of advisory engineers. The object of the service is to provide engineering information to the user of power transmission equipment so that he may select the type of equipment best suited to his needs.

The association was formed from among the manufacturers of power transmission equipment and at present numbers over a hundred firms making such products as chains, belts, couplings, speed reducers, pulleys, hangers and the like. The primary object of the organization, like similar trade associations, is to further the common interest, which is frankly stated to be the sale of more of these products where they can justifiably be sold. The service feature, however, is a step further along the line of co-operative effort.

The advisory board is made up of recognized leaders in plant engineering and power transmission problems in every division of industry. There is a representative from a steel mill, one from a textile mill, another from a chemical plant, yet another from a metal working shop. In all there are men from each distinct industrial division. The only connection of these engineers with the association is advisory and the contact is made between them and the association through one of their number acting as chairman.

The association is offering the consulting services of this board to anyone with a transmission problem in either machine design or plant. Contact is made by writing to the association in Philadelphia and describing the problem in design or in plant layout on which advice is desired. The association then forwards the request to its engineering board chairman. The chairman secures the desired answer from those of his board who have specific experience on the point in question, and returns the answer to the original questioner.

There is no obligation involved unless the question is such as to require extended engineering investigation for its solution. In this case a fee is charged commensurate with the service.

Not only does this part of the association setup offer the designer direct contact with field conditions, but it also removes from this contact all sales propaganda, which may or may not be beneficial. Likewise, it distributes over all of the association members the burden of service that is essential to present-day marketing.

Illinois Central Occupies

Modern Railway Shops

at Paducah

By FRANK W. CURTIS
Western Editor, American Machinist

SEPTEMBER, 1927, marked the opening of the Paducah, Ky., shops of the Illinois Central System, thus putting in operation one of the most modern and well-equipped locomotive-maintenance and car-repair shops in this country. Construction of the shops, which cover 82½ acres, was started in April, 1925, although prior to this date it was necessary to tear down the former shops that were inadequate to meet the repair requirements in view of the increased size of motive power now being used. Although most of the heavy work was handled at the Burnside shops, Chicago, together with smaller repair plants in the south, even these facilities were at a handicap to take care of the repair demands, chiefly on account of the great amount of rolling stock in operation.

In considering the arrangement of the equipment and buildings, plans for the floor layout and the selection of machinery were considered and approved by a mechanical committee, so that the final decision was based on opinions of a group, rather than those of any individual. Care was used in purchasing machinery, which, in addition to standard machines, includes special-purpose equipment for railway repair work.

A layout of the plant, showing the general arrangement of the buildings, is illustrated in Fig. 1. Among the larger structures are the locomotive shop, consisting of the machine and the erection departments, the boiler shop, the paint and tank shops, and the blacksmith shop. There are four through tracks leading from the erection department to the boiler shop and two through tracks between the boiler and the tank shops, so that units can be transferred from one building to another as desired. Transfer tables have been eliminated because each shop has crane facilities suitable for lifting the heaviest units from intermediate pits or tracks to one of the through tracks.

The practice in handling locomotive repairs is to use one of the through tracks located at the east end of the plant for incoming locomotives, dropping off the tender at a suitable point for delivery to the tank shop. This

The first of seven articles. The second will appear in an early issue.

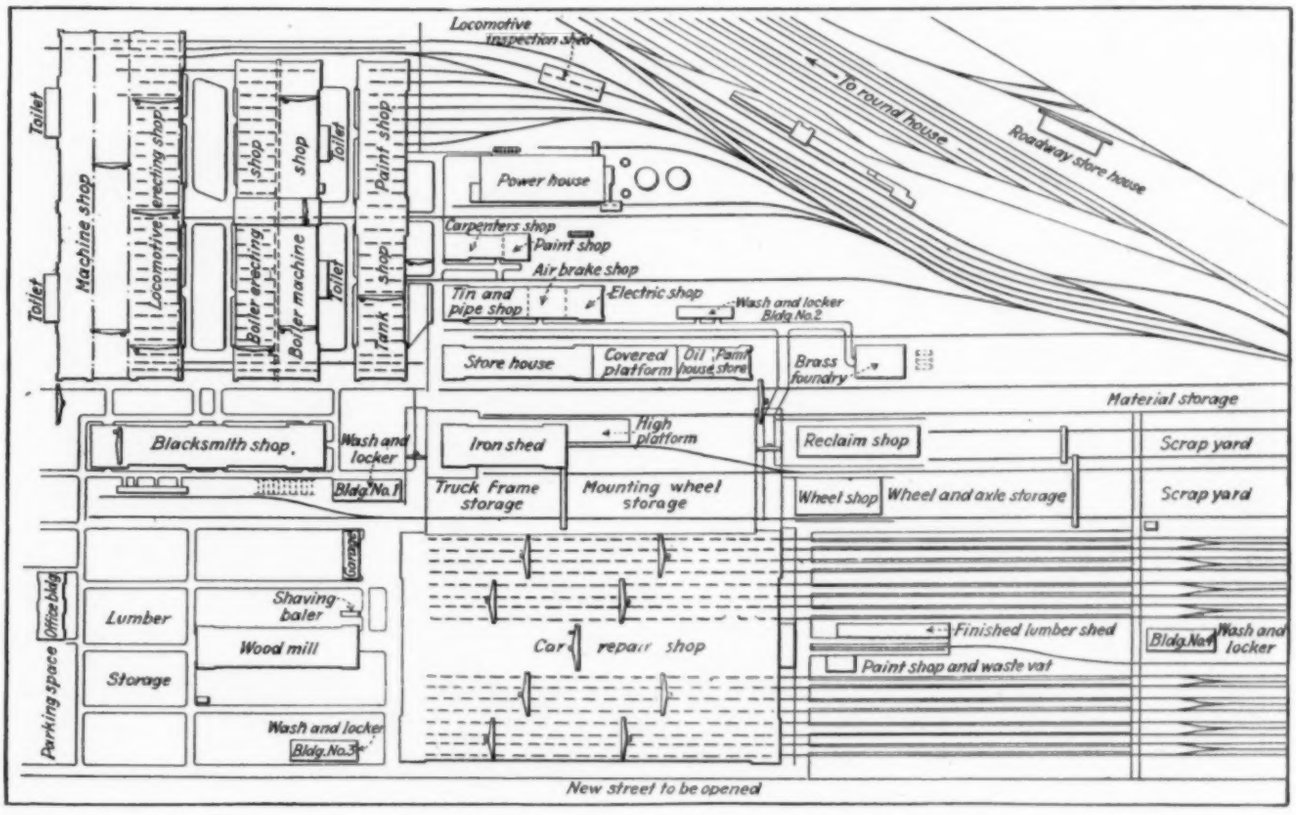


Fig. 1—Layout of new Paducah shops showing the buildings used for locomotive-maintenance and car-repair work. Cement roadways are located around the main buildings and through the yards to assist in handling materials. By placing the stores department buildings at the center of the plant, materials can be transported to any point of the plant in a relatively short time. Tractors and trailers are used to move materials

Fig. 2—The heavy-machine bay of the locomotive shop is served by two 15-ton cranes, operating the entire length of the building, and having a head clearance of 30 ft. The machines in the foreground include two large planers and a double-head slotter, all of which are used in machining locomotive frames. All machines are equipped with individual motor drives. The light-machine bay is located at the left and the erection department is at the right

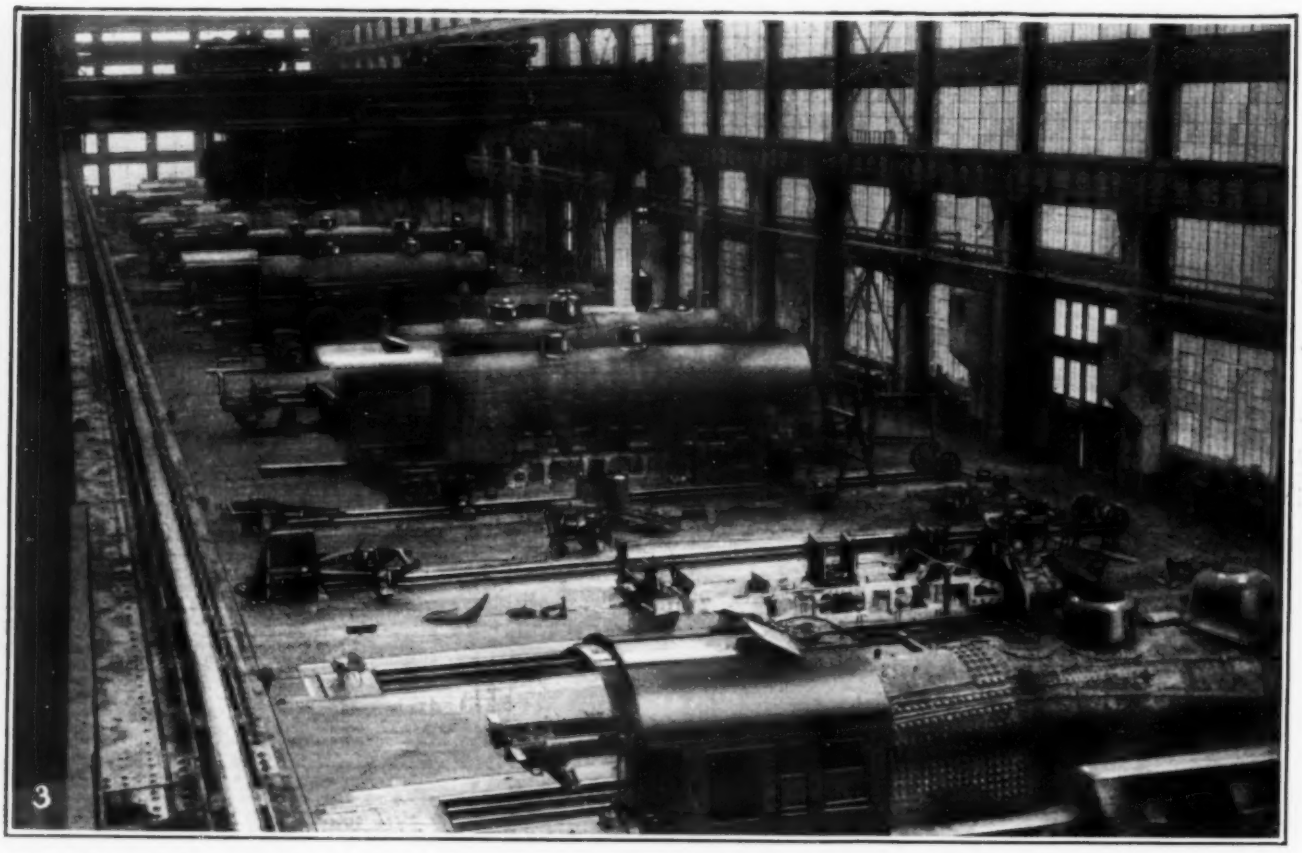


Fig. 3—Locomotives received for repair enter on the first track at the east end of the building, and are transferred to an available pit in the shop. A 250-ton gap crane, used for transferring such work, has a head clearance of 30 ft. Above this crane operate two additional cranes of 15-ton capacity, having a head clearance of 42 ft. Outgoing engines are transferred to a track at the far end of the shop when ready to be inspected

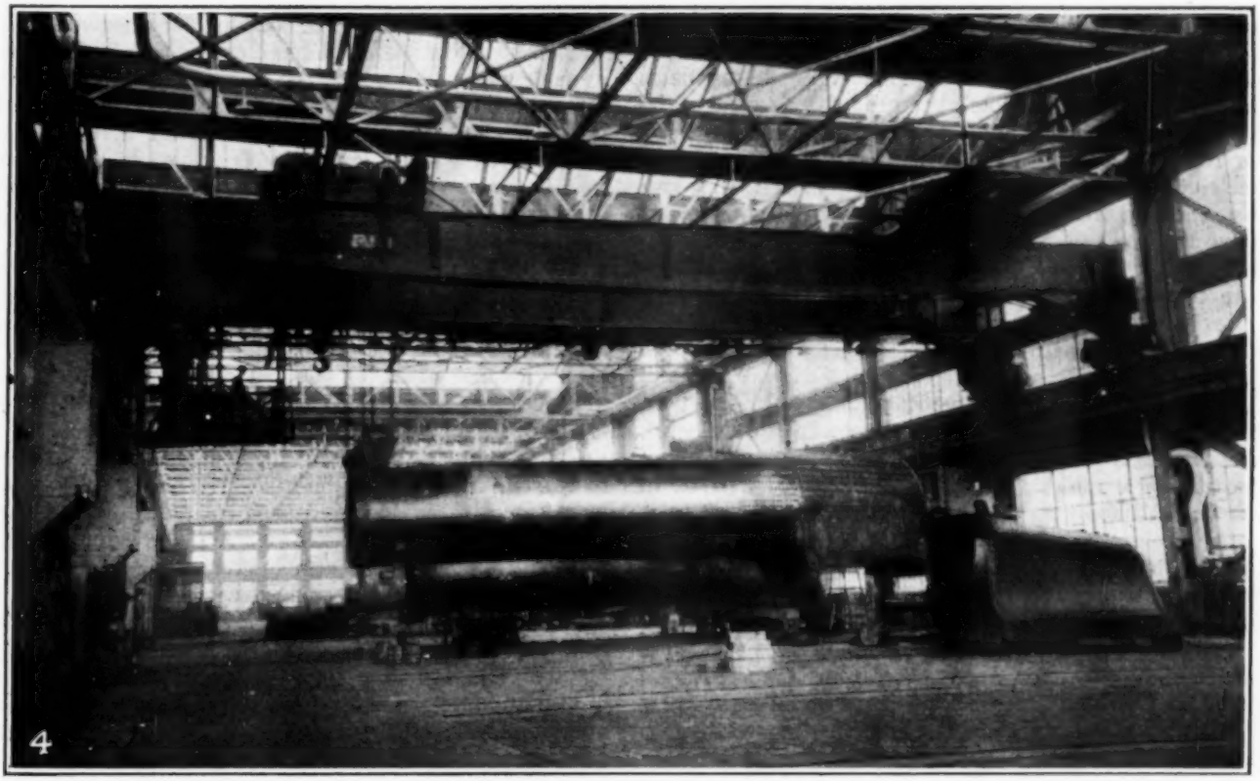


Fig. 4—Lying parallel to the locomotive department is the boiler shop. It is served by three travelling cranes. In the center of the building is a riveting tower that has a 25-ton crane operated through remote control. The equipment includes flanging presses, shears, rolls, drills and a complete line of bolt machinery

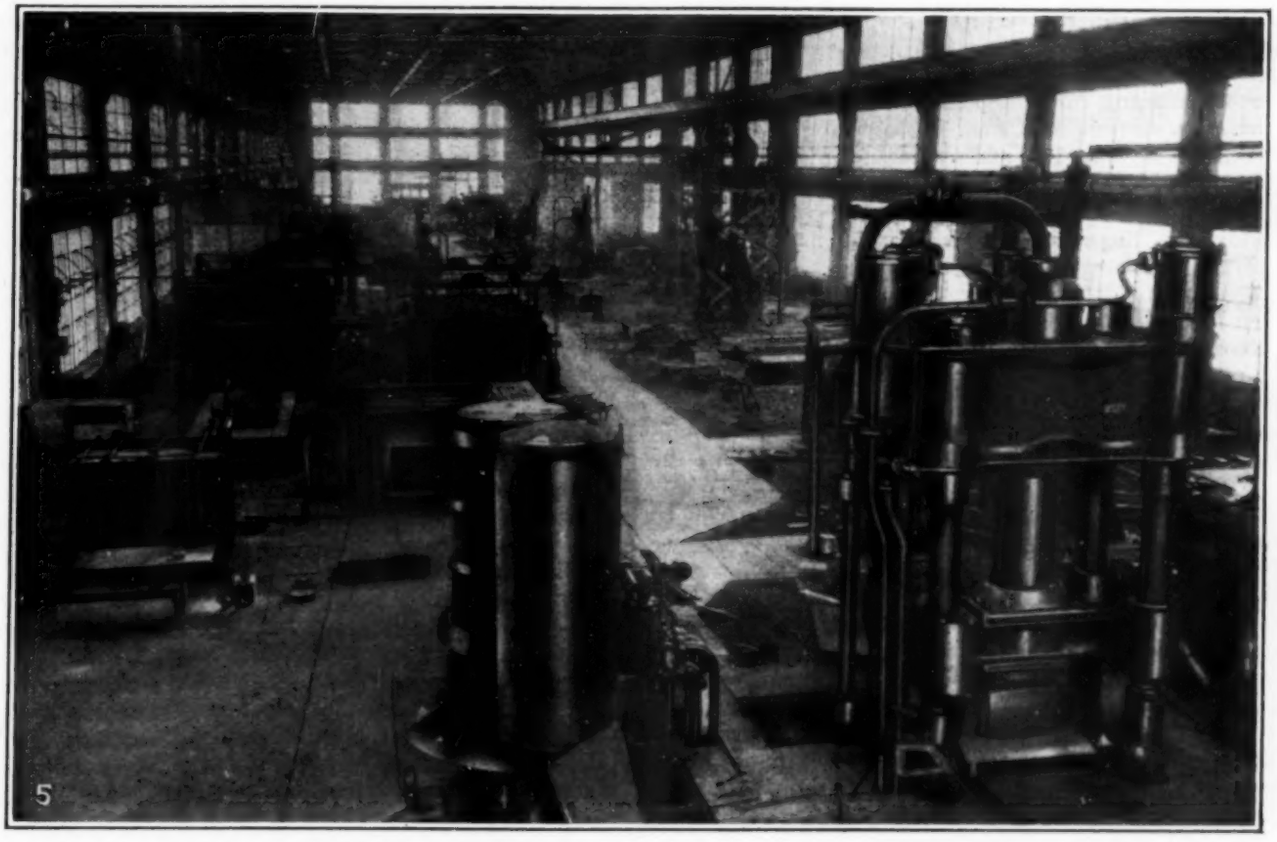


Fig. 5—General view of the blacksmith shop. In addition to a 20-ton crane, the department is served by ten jib cranes located at convenient points along both sides of the shop. At the right is a 1,000-ton steam-hydraulic press, while at the left, are two, car-type annealing furnaces for treating large forgings. The equipment includes steam hammers, forging machines and furnaces. Furnace temperatures are controlled by pyrometers

track delivers the locomotive to a stripping pit where all valve and motion work and various other parts are taken off. After stripping has been completed, the engine is transferred to an available pit so that, if necessary, the boiler can be removed and transferred to the boiler shop for repairs. Outgoing locomotives are transferred to a track at the eastern end of the shop, so that they can pass through the inspection shed shown in the layout above the power house. The two spaces of ground between the locomotive, boiler and tank shops are laid out with cement roadways that surround storage spaces for major parts.

At right angles to these three buildings is located the blacksmith shop, being separated by a section of ground, likewise laid out for storage facilities. This portion, however, forms part of the main material-storage yard, which is served by two 20-ton traveling cranes that operate on a runway 80 ft. in width and 2,510 ft. in length. Adjacent to this runway are the stores buildings. An unusual feature of the layout is that cement roadways are arranged throughout the yards and around the main buildings to assist transportation of materials, which are handled chiefly by tractors and trailers.

In connection with material handling, is provided a garage 30x100 ft., for tractors and other transportation devices. Facilities are provided for motor repair work, battery charging and miscellaneous repairs, relative to the equipment used.

Among other facilities is a central plant for generating acetylene. This building contains three 500-lb generators for producing acetylene, and tanks of oxygen that include a dual installation consisting of two sets so that a fresh supply is always available. The acetylene and oxygen both are piped to all shops in which they are used. Take-off valves for these gases are installed at prominent places in the various buildings. In the erection department, for example, these valves are located at each post, as well as at built-in floor boxes, located between pits at central points. When not in use the boxes are covered by steel plates.

Locomotives requiring major repairs only, are to be handled at these shops. During the first month of operation, ten major overhaulings were completed, this amount being increased during the next three months. The layout has been made with a view of turning out between 35 and 40 locomotives per month, which should be attained within the first year of operation.

At present the car department has not been fully completed, although a portion of the tracks are laid and several of the buildings constructed, enabling some car work to be handled. When completed the car repair shop will be 447x740 ft. and in all probability will be in service in about a year. In itself, it will be a complete plant, capable of repairing a large number of cars daily.

A general view of the heavy-machine bay of the locomotive department is illustrated in Fig. 2. This section is served by two 15-ton cranes having a head clearance of approximately 30 ft. In the foreground is shown a 40-ft. planer, a 28-ft. planer, and a double-head frame-slotter. To the left of the aisle are located other heavy machines, such as boring mills, milling machines and planers. The light-machine bay may be seen at the extreme left, and has a head clearance of 22 ft. This department does not have a traveling crane but depends upon miscellaneous air hoists and jib cranes.

The erection shop, located south of the heavy-machine bay, is illustrated in Fig. 3, showing the transverse pits, and several locomotives undergoing repair. This department is served by a 250-ton gap crane, shown in the center of the building with an engine suspended from it, and two 15-ton cranes that operate over it. The head clearance of the gap crane is 30 ft., while that of the smaller cranes is 42 ft. All of them travel on tracks having a center distance of 90 ft. and running the entire length of the building.

The machine and erecting departments of the boiler shop, are served by overhead cranes, operating on tracks having a center distance of approximately 77 ft. Two 15-ton cranes serve the machine department, having a head clearance of 29 ft., while a 75-ton gap crane, serves the erection department, has a head clearance of 21½ ft. A view of the erection department is illustrated in Fig. 4, showing the gap crane lifting a boiler. Midway between the ends of the shop is a riveting tower, served by a 25-ton crane, having a head clearance of 79 ft. and a width of approximately 48 ft. A feature of this crane is that it is operated by remote control from a switch at a 200-ton bull riveter located in the machine department.

A view of the blacksmith shop, taken from the north end, is illustrated in Fig. 5, which shows the general layout. In addition to a 20-ton crane, running the length of the building, ten jib cranes are located at convenient points to accommodate heavy work. At the time the photograph was taken, only two of the jib cranes had been installed, one of them being shown at the rear of the forging press at the right, and the other in the center of the west side of the shop.

Throughout the entire plant, all machines are equipped with individual motor drives. Special care was taken in laying out the machine in each shop so that ample aisle and clearance room would be available, regardless of the amount of work being handled. Among other features are up-to-date lighting, heating and ventilating facilities for all buildings.

Why Not Use Hydraulic Drive for Planers?—*Discussion*

By E. I. McGee
General Superintendent, Boyts, Porter & Co.

THE subject of applying hydraulic drives to planers, mentioned by Martin H. Ball on page 18, Vol. 68 of *American Machinist*, appeals to me as being timely.

At the machinery show in Cleveland last September, I questioned several of the planer salesmen, during their demonstrations of modern planers, as to the feasibility of applying "oil gear" drives or some other type of hydraulic drives to planer tables. In each case they were so quick to assure me that it would not work that I was led to suspect that each and everyone of them had been studying the subject.

It seems to me that with all the wonderful improvements that have been made in reversing-motor planer drives, that the planer is still a very slow machine where production is wanted. With so many applications of hydraulic feeds and rapid traverse movements in evidence at the show, it seems to me it is only a question of proportion and power to develop this system into a real, rapid-production drive for the planer table. I would be greatly interested in seeing this subject discussed further by those who know.

John Dick Explains
the sales engineer's duties

By F. M. A'Hearn

A SUMMER morning at the Coaltown Shops of the Coaltown & Great Western Ry. Bill Weston, the master mechanic, morning rounds completed, entered his office in an amiable mood. Things in shop working smoothly; not a bad old world after all.

A note on Bill's desk lowered the smile perceptibly as Bill eased himself into his chair:

W.W.: Sheave for Annex shop hoist O.K. Work on hoist completed.—J.F.

Bill looked up from the offending note to see John Dick and Jim Kelly enter his office. Bill, as usual, was glad to meet his two old friends of the apprentice days in the Dick Pump Works. "How is business at the Pump Works, John?" he asked. "Mighty glad to see you both. Odd, I was just now thinking of you and Kelly. I have something on my mind. Kelly is headed for more or less trouble. May need you, John, as a witness."

"Any serious trouble, Bill?" inquired Jim, with quick interest.

"No, not exactly serious, but too darned annoying for such a small matter. You remember the last time we three met Jim showed us how we could aid the supply people by giving their representatives proper aid at the time of their calls at our plants. Kelly pointed out our error in delaying a man an hour or so, and causing him to miss a train or possibly an appointment at another place. You know, I really felt guilty that Jim should have the opportunity to rake me over. He was right just the same. We really fail to give the other fellow sufficient consideration. When I say 'we' I include Kelly's clan, the supply people, because they sometimes develop bad cases of the same complaint.

"For example. Some time ago our plant was visited by a state inspector. It seems that while he was in the Annex, he told old Stubbs, the foreman, that he saw the chain of a hand-operated hoist slip over the sheave. That this condition was liable to cause an accident, and that he would expect the wheel to be replaced before he called again. Stubbs worried plenty. He had the hand chain inspected and found that the seats for the chain links were pretty well worn. Also that the chain, if worked fast on no load, jumped the links out of their seats in the sheave. That is what the inspector saw.

"Stubbs promptly wrote me a note telling me that he needed a new sheave for the hoist, and to please rush it. I turned the case over to my assistant, Flynn. Well, Flynn investigated and decided that while there was really nothing to worry over, we might as well have the sheave replaced while the matter was fresh in our minds.

"He found the hoist was made by the Hooks & Cable Co. and, therefore, referred to its catalog before ordering the replacement. He found that replacement parts were to be ordered by different numbers than those assigned to the original parts. Eventually we made a requisition for a new sheave. This is the order:

One handwheel, old part 99-B-4 new part 792. Replacement for 3,000-lb. Joker Hoist, c/o Foreman Stubbs.

"This order, you see, is dated April 29. On May 20 I got a note from Stubbs that read like this:

I have received a new hand chain wheel for Joker Hoist. Delivered May 19. Hand chain does not fit down into groove as it should in this new wheel. Number on the new handwheel is 225-B-4. Number on handwheel that I want replaced is 99-B-4.

"Directly, Flynn comes in with the sheave and a grouch. As the associations with Stubbs for the past three weeks have not been pleasant, he is downright 'crabbed' concerning what the future may bring forth. Well, on May 21, I wrote our storekeeper:

Our requisition file 8-449, your order No. 3891, handwheel. Old part 99-B-4, new part 792, for 3,000-lb. Joker chain hoist.

We have received handwheel number 225-B-4. The handwheel does not engaged properly with the links of the hand chain. Otherwise, it would answer our purpose. Will you please determine why order was not filled by furnishing part No. 792?

"On May 23 I received this copy of a letter from our stores department to the purchasing agent:

Invoice of Hooks & Cable Co., dated April 16, covering 1 handwheel No. 792 for 3,000-lb. Joker hoist, our order No. 3891, amount $3.42, passed for payment. Please note our order. We specified 1 handwheel, old part 99-B-4, new part 792. We received handwheel, old part 225-B-4, shown in their catalog also as 792. Handwheel received does not engage properly with links of hand chain.

Please arrange for exchange for handwheel as ordered. Attached is copy of letter from master mechanic for your information.

"The purchasing agent in turn wrote Hooks & Cable in an effort to secure the required sheave.

"On June 1 I received from our storekeeper a copy of a letter which had been sent by Hooks & Cable to the purchasing agent in reply to his letter requesting that the wheel be exchanged for a suitable wheel. This copy was enclosed with a letter from the purchasing agent to our stores department requesting further information as to our wants. Here it is:

In reply to yours of May 26, pertaining to the hand chain sheave wheel No. 792, which we supplied on account of your order 3891, we understand that chain does not engage properly in the pockets provided to receive the chain.

We would advise that the wheel supplied to you, as far as general fit is concerned, is identical with wheel 99-B-4. The wheel sent you is a steel wheel of improved type. Wheel 99-B-4 was a grey-iron casting and caused us some trouble. We, therefore, designed a new type of chain to use on either wheel.

Allow us to suggest that if you are having trouble with the chain in question, it is entirely probable that the same is worn in the links; it may be stretched, and therefore have a different pitch than the handwheel. This, you will understand, would hinder the chain from meshing properly.

We are very sorry that you are unable to use the hand chain in connection with this wheel, but suggest that you furnish us the length of the new chain which you wish to purchase. This chain, we assure you, will fit properly in the handwheel.

"Here, sticking out like a sore thumb, is the fact that the Hooks & Cable Co. entirely disregarded our statement that we had not received part 792, but received part 225-B-4. Let me quote again, in part, the first paragraph of their letter:

Pertaining to the hand chain sheave wheel No. 792 which we supplied account of your order 3891.

"Now, they state that they have supplied something, which is exactly what they have not done. As you see, I initialed this letter to friend Flynn to fix up an answer to our storekeeper's inquiry. Flynn's answer is so brief as to reflect a certain amount of sarcasm. The letter he dictated to the storekeeper is as follows:

Reference to correspondence relative to handwheel for 3,000-lb. Joker hoist. We ordered from Hooks & Cable Co. pamphlet, handwheel, old part 99-B-4, new part 792. We received instead, handwheel 225-B-4.

We wish to know if it is intended by Hooks & Cable that handwheel 225-B-4 is to be used to replace part 99-B-4, or if it is the 792 that is to be used as we understand from their pamphlet.

"Our storekeeper wrote to the purchasing agent, enlarging on the subject to state that:

The wheel furnished is smaller and of different pitch from the original wheel, which is the cause of the chain not meshing properly, and the trouble is not due to the worn condition of the chain, which is worn very slightly. If wheel 792 had been furnished instead of 225-B-4 there would probably have been no trouble.

"Evidently our purchasing department wrote in the same strain to Hooks & Cable, and some two weeks later sent our stores department a letter, a copy of which was forwarded to this office. This is it:

With reference to your letter of the 18th relative to the handwheel specified on order 3891, Hooks & Cable Co. states that the only way we can overcome our difficulty is to substitute for our old hand chain a new hand chain to fit the wheel recently supplied us, as it is evident that the old chain is worn and is of a different pitch from the wheel for which it was originally intended.

"I passed this letter to Flynn, who dictated a reply:

Reference to Hooks & Cable Co. correspondence concerning hand chain wheel for 3,000-lb. Joker hoist, our requisition 8-449, your order No. 3891. The first paragraph of their reply of May 28 states "Pertaining to hand chain sheave wheel 792 which we supplied, etc."

This, as we have indicated in our several letters, is misleading. We did not receive No. 792. We received No. 225-B-4.

The Hooks & Cable Co. seems to disregard our several statements that we did not receive the wheel that we ordered. Instead, we are advised that a new chain should be purchased to fit the wheel furnished.

Our inquiry, in the second paragraph of letter to you in answer to your memo of June 10, is not answered beyond the general statement in the Hooks & Cable Co. letter dated May 28 "that they have sent us part 792."

We do not know whether they are still assuming that we have the wheel we ordered or whether they intend wheel 225-B-4 is to be used instead of 792, indicated in their pamphlet.

Their reply giving us the information asked for will enable us to decide whether we are to return wheel 225-B-4 or to order a new chain.

"After our storekeeper received the letter dictated by Flynn, he passed the information on to the purchasing department. A few days later the storekeeper sent me a copy of a letter sent him by the purchasing department:

With reference to your recent letter of June 27, the Hooks & Cable Co. advises that it will furnish us an improved all-steel hand chain sheave, part 792 for 3,000-lb. Joker hoist. Please inform me upon receipt of this casting if the sheave is entirely satisfactory. We will then furnish shipping instructions for the part which you state you cannot use.

"In due course of time, the long expected part 792 arrived at the shop, not, however, without further correspondence. In a copy of one letter I noted a reference to a telegram directed to headquarters advising of the receipt of part 792, together with shipping instructions, which finally removed the troublesome piece 225-B-4 from our midst. Another letter mentioned an express receipt covering return of part 225-B-4 to Hooks & Cable. Following that we had a letter from the purchasing department to our local stores department, mentioning the credit memorandum of $3.42 to cover the value of piece 225-B-4, together with other instructions concerning the credit. We were assured by that time that the troublesome handwheel had been returned to the point of its origin. We also noted that the Coaltown & Great Western Ry. had been credited with the princely sum of $3.42. The incident closed with the brief note from Flynn, which advised me that the work on the hoist has been completed.

"Summing up the matter, it would probably have been cheaper, at least more satisfactory in the long run, simply to have ordered a new hand chain to fit the sheave we were furnished. However, it was plain to all concerned that Hooks & Cable had through an oversight furnished the wrong piece, and we assumed with each succeeding letter that the matter would be cleared up.

"By going back to the date of the first letter you will see that practically three months elapsed from the time when Stubbs made his requisition until the piece was delivered. I believe, friend Kelly, you will agree that no shop man ever caused a supply man any more inconvenience; nor by comparison, as great a delay as Hooks & Cable have caused us in connection with this incident. I will now ask you, Jim, to explain why, when sales companies are making strenuous efforts to further the interests of their trade, I should be annoyed by any such cussed nuisance as this."

"Understand, Bill," answered Kelly, "you are asking me to explain something beyond the boundaries of the sales end. It would be a similar case if I asked you to explain the reason for discourtesy on the part of one of the ticket agents working for your railroad. I admit that conditions such as you have described are entirely and absolutely wrong, but the trouble lies with the Hooks & Cable manufacturing division rather than the sales organization."

John Dick, who had been silent, broke in. "Fellows, as I see it, the C. & G. W. Ry., together with Hooks & Cable, are equally at fault. In the first place, I would not attempt to defend Hooks & Cable for the careless method of filling an order. On the other hand, according to your own statement, their sales department offered help to you, had you used the help. You said that the Hooks & Cable man sometimes called here. Has he been here since the sheave was first ordered?"

"Yes," answered Bill, "he did call about the time this

correspondence was getting well under way, but as we were not in the market for the hoists, and I was busy, I couldn't see him."

"You say that this man who calls is a sales engineer?

"Yes, that is his title."

"Does his title mean anything to you, Bill?"

"Why yes, certainly, it means he represents the Hooks & Cable Co."

"I would understand," continued John, "that he was an engineer of some description. I would further understand that in addition to being able to greet you with a pleasant smile and give you descriptive matter on the latest products of the Hooks & Cable Co., in addition to selling you a hoist, this man was amply informed in the construction and operation of Hooks & Cable products. It is entirely probable that the sales engineer you mention would be able to construct a hoist throughout. It is also highly probable that he would have detected the error in sending the wrong sheave wheel as soon as he laid eyes on the sheave. The majority of those sales engineers are mighty practical fellows and are always at their best when given an opportunity to straighten out tangles like that you have just experienced. Did this fellow see Stubbs or Flynn the day he called here?"

"No, I don't think he did."

"Does he know Stubbs?"

"Can't say that he does."

"Suppose now," continued John, "that we imagine a condition like this exists in a shop. Let us assume, when you purchase a piece of equipment, you imagine that the sales engineer who drops in from time is indirectly a member of your own organization. In that case would it really be necessary for him to wait for a pass to enter your plant each time he called? Wouldn't it be better if he had some kind of a permanent card of admittance that would allow him to pass through the works, look at the equipment built by his company, and talk to the operators in order to learn if there were any complaints? The Hooks & Cable man probably could have sent his card in to you, told your clerk that he would walk out in Stubbs' department for a few minutes, and be back in ample time to see you, provided that you wished to see him.

"Suppose that Stubbs had seen him after the wrong sheave was delivered. Wouldn't Stubbs have given him the complaints he handed to Flynn? Now, suppose again that Hooks & Cable would require their men to get quick action on complaints and the more direct the action the better. In that case, he would probably have mailed a report the same day to the factory. The report would have been directed to the attention of the manager instead of to the desk of the shipping department. Are we safe in believing that the head man would then get busy? It appears from this stack of correspondence that someone whose principal duty was to pack and ship goods, rather than to know the mechanical details of the product, has been handling this shipment.

"The Dick Pump Works is a small concern. For that reason I do not feel competent to tell how railroads or supply companies should be managed. My advice, however, is this: Outgrow the idea that the supply company representative is useful only as an order taker, or as an instructor to make a half-day trip to teach your operator to pour some compound into a cooling tank when the contents of the tank get below the intake of the pump.

"I don't believe that a company building equipment should be expected to look after the maintenance of its product for years after the product is turned over to the purchaser, but I do believe that the supply representative is a mighty good advisor and counsellor. Treat him as such. The next time you have a case of this kind come up, if you don't get what you order, just try informing the nearest branch of your trouble. My forecast is, if you do this, you will get action and get it quickly."

The Cost of Special Designs

THE ever changing conditions of industry are reflected in all lines that play a part in it. The great growth of the automobile industry, for example, directly affects the makers of forgings, of steel stampings, of machine tools and other lines of work. The changes in body design, for instance, affects the builders of body hardware, of lamps and other accessories so that it is no longer possible to make or carry a stock of standard lamps or door handles or what-not. They must be different for each make of car and must change several times a year to suit "new" models and give salesmen something to talk about.

Nor is this tendency confined to small parts. Makers of grinding machines, milling machines and the like also feel the changed attitude. Some makers find it no longer possible to build complete machines in lots as formerly because of the changes demanded by their customers. Each machine must be equipped with special work holding devices to suit the particular work to be done, and these devices must be made by the builder of the machine instead of by customer as formerly.

This condition results in machine builders greatly enlarging their toolrooms or establishing special departments, and in the average shop the making of these fixtures is apt to delay completion and shipment of the order. The making of fixtures may be a legitimate function of the machine builder. If so, it needs better organization in a special department in many shops, and it also needs careful attention from the manager and the cost department. For the cost of such fixtures is frequently very much higher than is realized.

There are two factors to be considered in figuring the costs. One is the cost of the engineering, design and building of the fixture itself and the other the added cost in building machines piecemeal, or in smaller quantities than formerly. While the latter cost may not be chargeable directly to fixtures, it is due to the changed attitude in buying and is a real part of present manufacturing costs.

As special machines, or machines with special attachments, are used by large producers only, and as the profit from their use continues over a period of years, the user generally reaps a much greater benefit than the maker. He should, therefore, be willing to pay a price that gives the builder a fair return to enable him to develop still better machines.

· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Shall It Be Layoffs or Short Time?

"LOOKS like we might have to lay off some men, Al. And I hate to do it, the worst way." The foremen had just come from a meeting in Williams' office, and had been told that there were fewer orders ahead than usual.

"Does seem to be a little falling off in orders, Ed. Hope it won't last long. But I'm not sure we want to lay off many men—if any."

"How can we help it, Al? Can't keep them busy when we haven't the work for them. Can't run a shop with part of the men idle."

"True enough. I hadn't any notion of keeping them around as ornaments. But, I've a sort of leaning toward dividing the work up a bit, so as not to throw anyone out in the cold without a job."

"But that's up to Williams, isn't it?"

"Guess it is, Ed. But he's always open to suggestions, you know. Had a talk with him some time ago. Perhaps that's why he didn't give any orders about laying off men."

"Well, what's the answer, Al?"

"Perhaps it isn't the answer. But I suggested to Williams that if the time came when we didn't have work enough to keep all our regular force busy, we put it up to the men as to whether they would rather take their chances of laying off, or work short time and keep all hands on the pay roll. That is what I would want to do."

"Just how do you mean, put it up to the men?"

"Why, ask them to vote on the question, Ed. Call a meeting, seems the best way, and explain the case to them. Tell them we are likely to be a little short of work for a few weeks, that it seems better to us to keep our force together by each working fewer hours, than to lay off any men. Put it up to them which they'd rather do."

"Doesn't that seem like asking the men how to run the shop? If we think short time is better than laying some off, why not do it and forget the voting?"

"Guess you forget that you like to have a choice, don't you, Ed? Wouldn't you rather have Williams ask you which you would rather do, than tell you to go do his way? Besides, this is a problem that has several sides. It's better for the shop organization if we can keep the whole force together, so we naturally favor it. But if a man is laid off, it affects his family, so it ought to be up to the men to voice their opinion as to what the majority thinks on the matter."

"Well, Al, I know how the newcomers will vote, but I'll be anxious to see how our old-timers, who are certain that they will not be the ones let go, will vote the brotherly love stuff and take short time so that somebody else won't be laid off."

Are the old-timers willing to sacrifice and go on short time to save some men from a layoff, and to keep together the staff? Was Al correct in thinking that the men should vote on it? What would you do in your department?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Making Time Studies

TAKING time studies under cover is bad practice, and I do not see why it is necessary to do so. As the department superintendent is responsible for all costs, it is for him to see through his foreman that the job, when ready for timing, is being done the best possible way. Then, the time-study man is called, and if there is anything that does not seem right to him, he goes to the foreman, talks it over, and settles the question. This, of course, is easier said than done. I have had to convince myself and the foreman by taking time studies his way and my way, and sometimes have lost and sometimes won. But the fact is that we both agreed after the trial, and we were both benefitted by it. It is very essential to have the foreman satisfied the way any operation is run. A time-study man can change anything as long as he convinces the foreman first, as the foreman is running the department, and not the time-study man.

—A. C. NOLKE.

FOR successful time studying the department responsible should co-operate with the foreman, so that he will know when time studies are to be taken in his department, and so that he can notify his men accordingly. If there is co-operation between the time-study department and the foreman, there should be no difficulty about the relationship between the time-study man and the foreman. Obviously, if the time-study man comes even partially under the control of the foreman, or if he is entirely independent of the foreman, relations will be somewhat strained, and trouble might easily arise.

—H. H. LUSTY, *England*.

Keeping Track of Improvements

AT OUR works we have an improvement committee, where the director, the works superintendent, assistant works superintendent, and shop representatives meet once a month to discuss matters of general interest to the firm, including suggestions for improvements. The shop representatives are workmen elected once a year by the men.

If a workman has an idea for bettering methods, he writes it down, making a sketch if necessary, and gives the details to his shop representative. The latter takes it along to the next meeting and gives it to the secretary, who presents it to the committee. If the idea is considered worthy of the attention of the management, the whole job is gone into in regard to costs and other details, and finally an award of cash is given to the man who sent in the suggestion.

This method works well, and the man who thinks of the idea gets the credit for it, or at least part of it. All works should have some means of making full use of the brains and practical knowledge of their workmen, but it should be a direct method, and not through the workman's departmental head, or foreman, by word of mouth.

—J. W. JORDAN, *England*.

Giving Men Credit for Good Work

I AM with Al in telling men when they do good work, but this rule should work both ways. By this I mean that a shirker should not be carried along for a period of years, as is sometimes done, and all of a sudden have the plant wake up to the fact that he should never have been kept on the job. If the firm has a large number of employees, then the shop paper method of publishing the notices should be used. If the shop is small, the bulletin board method should suffice.

At the plant where I am employed, we have about 4,500 employees, and our shop paper is issued once a month. On its pages will be found pictures and write-ups concerning men who have performed meritorious service, either at their own jobs or by sending in suggestions whereby the cost of manufacture has been reduced or the quality improved. This paper, when given to the workers once a month, creates as much interest as does an extra edition of our city paper. And if Ed is human, like the rest of us, he cannot tell us that he is going to throw away the paper that has a write-up or photo of himself on its pages, especially if he has a wife and children at home.

—S. W. SULLIVAN, *Foreman*.

GIVING widespread publicity to especially good jobs by posting bulletins about the men who do them, is rather a ticklish undertaking. In the first place, it tends to step on the toes of the other men. The other men may feel that though they are doing just as good work,

THE · NEXT · TOPIC

Discovering Hidden Ability in the Men

ADVANCE QUESTION

Isn't it true that there are many men capable of shouldering responsibility who are undiscovered just because management takes no steps to uncover them?

it is their misfortune to be on routine jobs that do not come to attention. A better way is to give the man who has done a good job a personal commendation. If he continues to do exceptional work a boost in pay is a mighty convincing way to express approval. In this way the chance of the men "playing to the grandstand" on a particular job to get a bulletin, rather than to plug at it every day, is obviated. —ALBERT HOERSCH.

Calling Down the "Old Man's" Relatives

IT HAS often occurred to me to ask why "no smoking" rules are so elastic, and why the shopmen are usually the only victims. In one shop, where there was a "no smoking" rule, it was necessary at noon for all who had any desire to smoke to go outside. Likewise, in the morning it was necessary to stay outside to finish a smoke. But a little later we have the arrival of the luminaries, the engineering department, factory manager, and executives. All of these finish their smokes inside, and smoke during the noon hour inside of the building. Some others smoke any time during the day, or all day if they so desire. If there is anyone who can explain that ruling, then I, and perhaps many more, would like to have it done.

There are, of course, all kinds of executives. The differences in their vision of justice is often very distinct. However, any fair-minded person can arrive at only one decision, and that is, to commend the watchman for the performance of his duty. Perhaps I may be wrong, but I have often thought that executives should be somewhat of an example to the average worker. But the attitude some of them seem to have is "don't do as I do, but do as I say." —WALTER W. YAEGER.

Foremen as Inspectors

THE foreman is paid to get out production. Naturally, his firm expects quality as well as quantity. There is little gain in large production if there are many rejections. Usually, it means a loss.

Too many foremen pass the buck to the inspector, perhaps with some justification. Yet, one can't get away from the fact that the really successful foreman produces quality as well as quantity. It is therefore his business to see that the work is coming right. It is also the duty of the workman to produce usable parts.

—GEO. BOARDMAN PERRY.

Getting Ideas from New Men

STIMULATING the formation of ideas, and giving men leeway on methods, helps to develop reliable men. It breeds men of originality and initiative. Hence, Al was wise in sounding the new man on the pump job methods, and Ed makes the very common mistake of assuming that his methods are efficient because they have proven satisfactory in the past.

—F. C. EDWARDS, *England.*

The Hidden Cost of Accidents

WHEN it comes to figuring the costs of an accident, doctor's bills and compensation are but a small part of the total. There's the loss of production efficiency in putting another man less experienced on the work, as well as the loss of that replacement man on his regular job. Often the same accident that lays up the man may also lay up the machine. Then there is the interruption of the flow of production schedules all along the line, as well as the possibility of losing a customer due to delayed deliveries. An accident hold-up is also indefinite in its nature, as there is no certainty as to how long the injured man will be out, which makes it hard to plan for the emergency. In fact, one small accident may start a chain of circumstances which when looked back upon, seem hardly possible, and the little accidents that do not figure on the cost sheets at all are sometimes very expensive propositions. —GEORGE W. STEDMAN.

THE accounting system does not reveal the indirect cost of accidents to the employer, and because this expense is hidden, a great incentive for safety work is overlooked. When an employee is injured, who pays for the time lost by other employees who stop work out of sympathy or curiosity, or to assist the injured employee and discuss the accident?

Then, the foreman and other officials must take time off to investigate the accident, to shift the work to another machine, and to break in another operator. The clerical force must stop to make out accident reports, and somebody must attend a hearing before the industrial commissioner. Broken tools or machinery must be repaired or replaced. Production is held up. Failure to fill orders on time might also cause cancellation or dissatisfaction on the customer's part. These are all monetary losses which the employer sustains, and which are not covered by insurance, and are not usually realized.

SYDNEY E. CLARK.

Posting Too Many Rules

RULES should certainly be posted in shops, but the chief points contained in them should be explained verbally by the foreman whenever new men are put on. It is well known that a man will always say that he was not told, whenever he breaks a rule. Verbal instructions can never be proved, whereas the printed rules are there for all to see. Naturally, it is a part of the foreman's duty to see that such rules are carried out. In our shop we have had printed in the form of a small booklet all rules for the various departments, and also useful information applicable to the shop.

—C. GOWLER, *England.*

Paternalism or Privacy?

OBVIOUS enough, privacy in the home is a most desirable factor that every individual strives to maintain. Therefore, irritability on his part is a certainty, if his employers attempt to invade his domicile with attempts to act the part of the good Samaritan.

Beyond a question of doubt, the workmen would consider such an encroachment as a humiliation of their abilities to provide amply for themselves and, consequently, would look with scorn upon these offers. This inevitably holds true even if the wage scale maintains its standard, or if it is regulated in proportion to balance the cost. —HARRY OTTERSON.

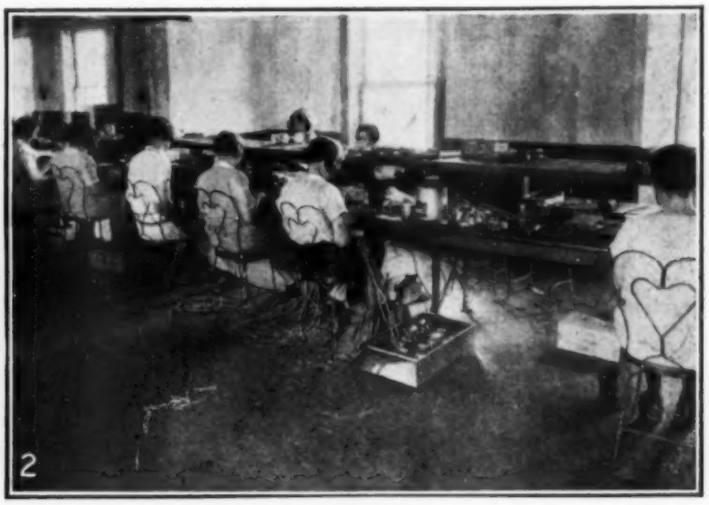


Fig. 1—Assembling radio-charger transformers. Fig. 2—Panels and primary leads are joined to the transformers at this point

Conveyor Aids in Reducing Assembling Cost *of Radio Units*

WITHOUT the aid of flat-belt conveyors, the Fansteel Products Company, North Chicago, Ill., manufacturers of Balkite power units, would be confronted with a serious material-handling problem in the building of its radio products, yet with the simplified method now in use, it is safe to say assembling costs are at least one-third less than they ordinarily would be. Although battery chargers, and A- and B-power units, are assembled in a similar manner, the information shown chiefly concerns the assembling of smaller charging units.

In brief, the system for assembling these units employs a flat-belt type conveyor, 210 ft. in length, which runs between work benches so arranged that the operators can easily remove or put on the units as assembly progresses. The conveyor, traveling at a speed of 25 ft. per min. passes several departments, each of which performs a certain portion of the assembly.

Receiving Materials

All machined parts and other materials required, are transported to the assembly department by hand trucks, and are placed adjacent to the location in which they are to be incorporated in the chargers. Several smaller sub-assemblies that cannot be accommodated on the main line, are assembled at benches likewise located conveniently at the point where the units are to be used, so that once the raw material has been received, practically no manual material handling is necessary.

At the start of the line, transformer assemblies (consisting of coils and laminations) are placed on the conveyor as they are completed by several operators, as illustrated in Fig. 1. Laminations are received in racks, as shown, being stacked in this manner in the press department. The benches are placed at right angles to the conveyor to lessen the reach otherwise necessary in view of the space required for raw material. When the transformer assemblies reach the operator standing at the left, they are given an electrical inspection consisting of core-loss, secondary-voltage, and break-down tests, after which they are replaced on the conveyor to proceed to the impregnating operation. Here, likewise, the transformers are removed from the conveyor, strung on racks, impregnated and replaced on the conveyor.

Joining Sub-Assemblies

Panels and primary leads are examples of sub-assemblies handled at adjacent benches, Fig. 2 illustrating these parts being joined to the transformers at the main line. The operators merely collect a number of the parts at intervals and as required, so that practically no time is lost. This method has the added advantage of giving the operators an opportunity to relax, which is equally important in such classes of work. At the same location the transformers are put in metal cases, examples of which may be seen on the table. The units, after being assembled this far, are again placed on the conveyor in order that they may proceed to the next station, where they are filled with black wax. For this operation a number of units are taken from the conveyor and are placed in racks, so that they can be filled in groups.

Final assembly, comprising the connecting of the transformer and a rectifier cell to the case, is handled next, Fig. 3 showing the location of the operation in the main line. The press at the far side of the line is used to clamp the transformer assembly to the base. After the units have been assembled, they are again placed on the conveyor and travel to the final testing operation, illus-

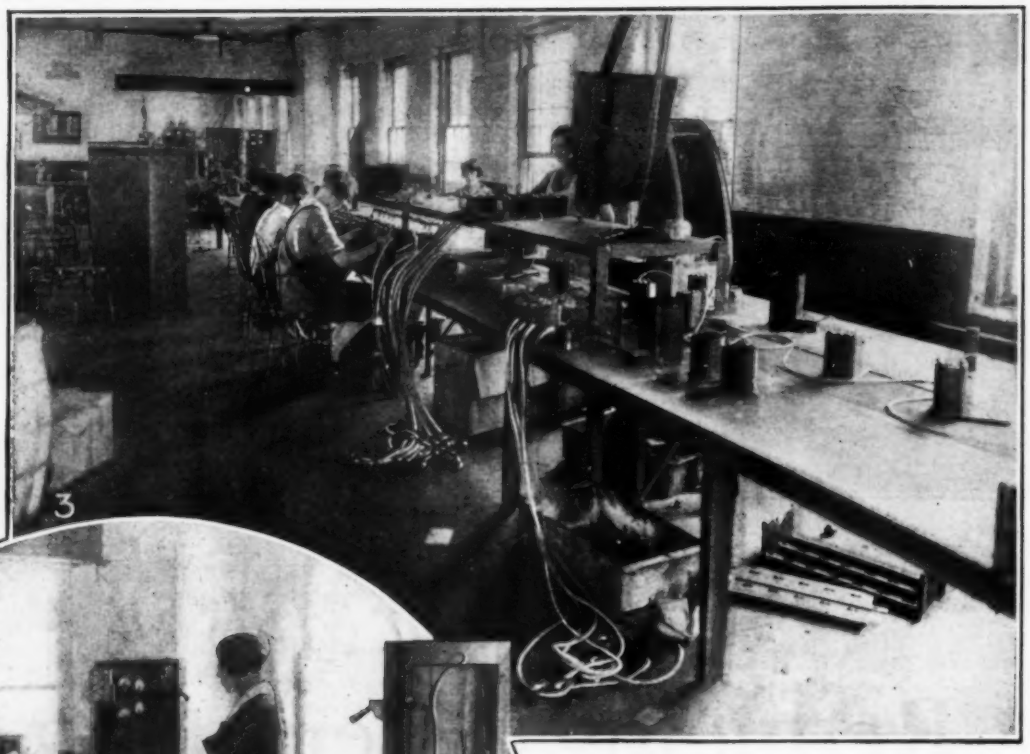


Fig. 3—After the transformers are filled with wax they are assembled to the base of the charger, after which the rectifying cell is attached. This operation completes the assembly, which in turn is placed on the conveyor to proceed to the final inspection test

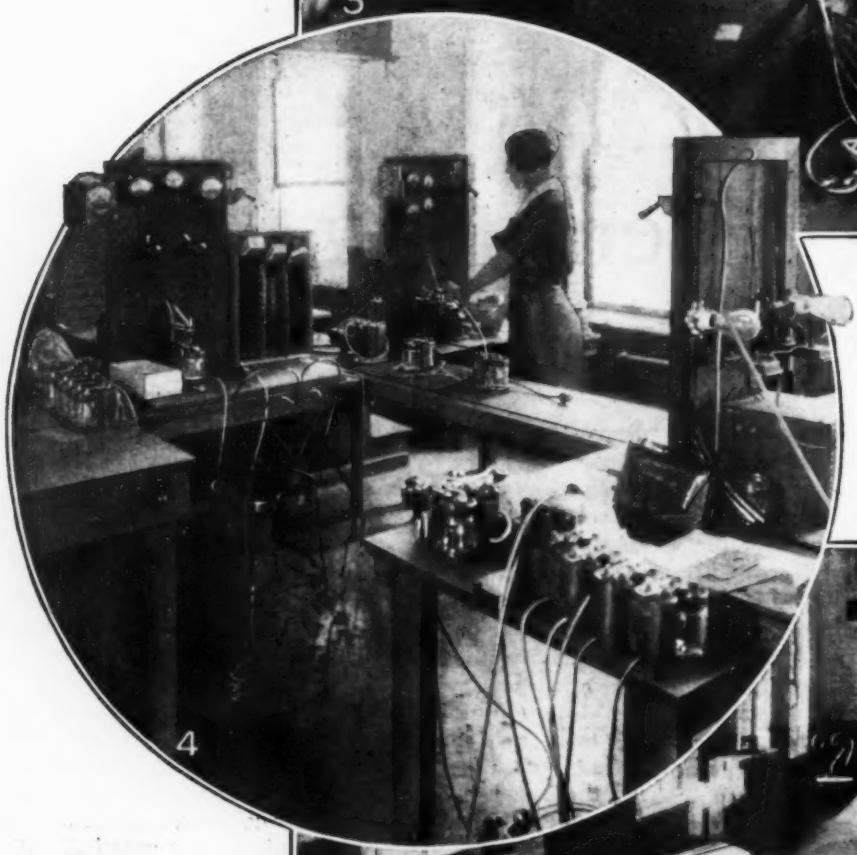


Fig. 4—A final electrical inspection, consisting of core loss, charging-rate and high-voltage breakdown tests, is made at this point

Fig. 5—The final operation consists of placing the chargers in cartons and applying identification tags thereto, in which condition they are ready for shipment. Transportation to the shipping department, located two floors below, is by means of a spiral conveyor

trated in Fig. 4. At the left is a smaller-sized charger and at the right one of the larger sizes, being tested. Core loss, charging rate and high-voltage break-down tests, as well as a visual inspection, are given each unit.

Leaving the final test, the chargers are complete as far as assembling is concerned, but they are returned to the conveyor and proceed to the boxing department, illustrated in Fig. 5. Here the units are packed in cartons, tagged, stamped, and transferred to the shipping department (two floors below) by means of the spiral conveyor shown in the lower left-hand corner. The chargers pass through the housing to be seen in the foreground, each style entering individual passes equipped with counters so that a record of the day's work can be ascertained at any time.

Other power units assembled on floors below are completed at about the same floor location so that the logical position for the shipping department is directly under

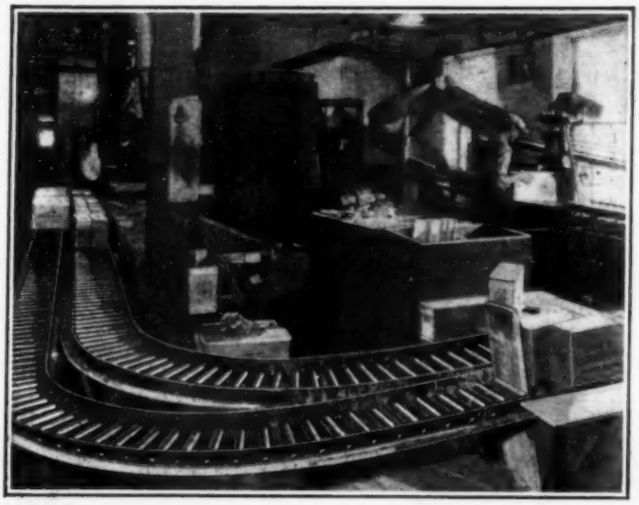


Fig. 6—Radio chargers, as well as A- and B-power units pass through the shipping department where a production record is made. The smaller chargers pass on the outer line while the heavier units necessitating packing in boxes, first pass the nailing machine shown. By having the finished assemblies transported by spiral conveyors from the floors above, a considerable amount of time is saved, resulting in lower handling cost

the end of the conveyor lines. A view of this department is given in Fig. 6. The smaller charging units travel on the outside conveyor, but other units, being heavier, are packed in wooden boxes so that they must first pass the nailing machine shown. By the use of a spiral conveyor to transport the units from the floors above, much hand transportation is eliminated, which in itself helps materially in reducing handling costs.

The production of the charging units described is 2,000 of each size or a total of 4,000 chargers per 9-hr. day. Other power devices are constructed proportionately, the yearly output amounting to over one million units. Radio manufacture is a seasonal business, so that assembling is handled only at certain periods during the year. The practice at this plant is to make parts during the dull season, then put all the available force on assembling when the demand increases. By this method certain storage facilities are required for both the raw materials and the completed units, but the saving in assembling large quantities at a time, rather than on a smaller scale continuously, more than offsets what storage charges may be placed against the stock.

SEEN · AND · HEARD

By John R. Godfrey

Playing fair with customers—Welding and cutting

I RAN across a case of real business ethics that boosted my faith in human nature a lot. The boss of a small shop that does a lot of special sheet metal work and has the reputation of doing it right had been making some special brass cases for another small shop, and it took quite a lot of experimenting on his part to get them right. The shop had paid his price without a murmur and he stood by it loyally—even when it meant a loss to him.

Competitors of the small shop wanted to break into the game and underbid it on similar apparatus. So the competitors went to the old sheet metal worker and wanted him to make the cases for them. Legally he had a perfect right to make them—but he wouldn't touch the order.

"It took a lot of work to learn how to make those cases," he said. "The first shop paid for all the time I took to learn how to do it. Now you want me to injure my good customers by passing this 'know how' along to you so you can undersell him. Well, I don't do business that way. The information I've tucked away at his expense don't go to his competitor."

And in spite of all arguments the fact that the competitors' orders might exceed those of the original customer, the old man refused to touch their order. Incidentally the competitors had so much trouble getting the cases that they lost money on the job.

Flame welding and cutting, except when it is done by machine, depends as much upon the personal skill of the operator as any job that I recall. The case has two sides to it, however. There is a strong appeal to the man with individuality and initiative, the danger of personal carelessness or poor judgment is also involved.

Just as an indication of the great human variation in this operation, a recent test of a number of operations on a cutting job showed variations as high as 35 per cent in the metal cut per cubic foot of oxygen used, and of about 75 per cent in the ratio of oxygen used to the cost of labor. Here is an operation where opportunity awaits the skilled man and where a careful study of results is in order.

Machine welding is doubtless more reliable and more uniform, but there are many places where it is not advisable or possible as yet. Some incentive both as to quality and cost, in both time and gas, will help to get better results. Then too there are still some metals where the effect of the heat prevents the use of welding.

A pair of goggles over the eyes is worth a dozen pairs on the shelf. Do you insist that men wear them when they should?

We all make errors—that's why rubbers are furnished on lead pencils. But try to make the rubber last the life of the pencil.

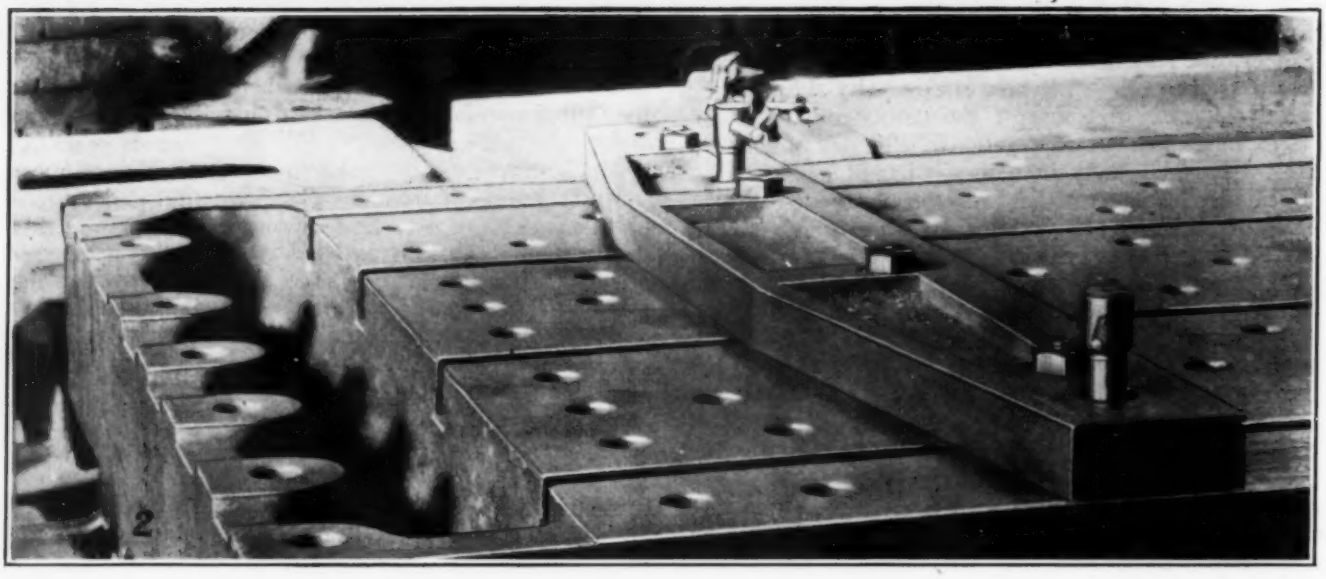
Little Devices That Are Big Helps

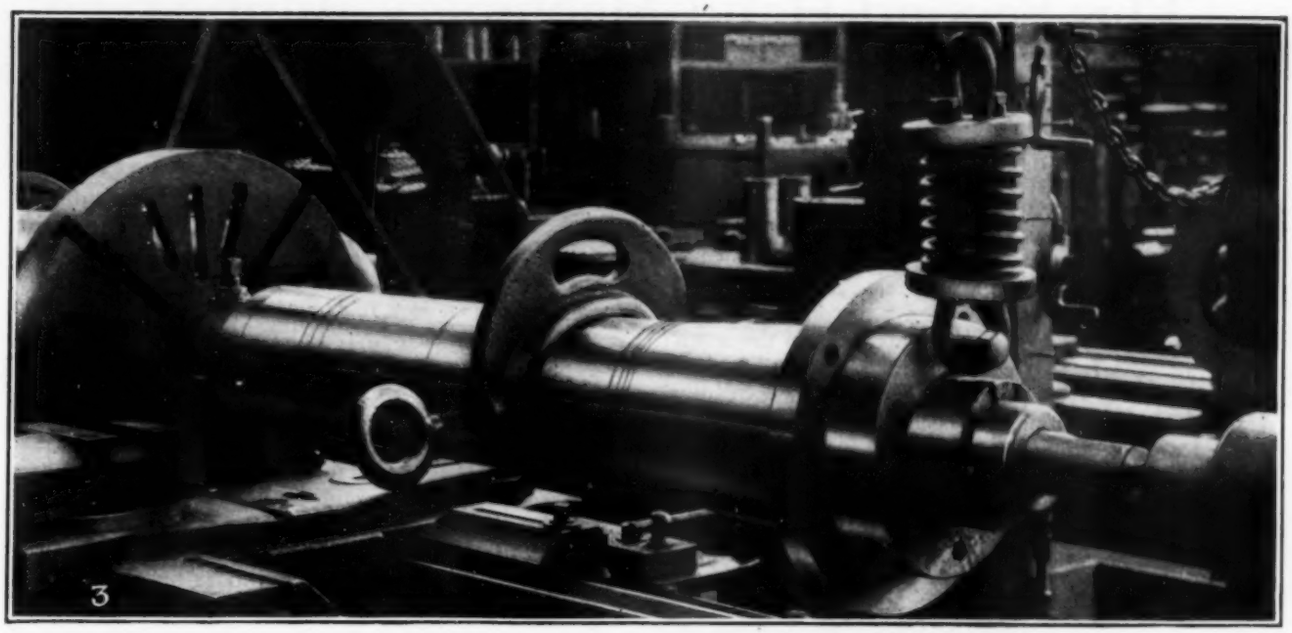
Photographs by courtesy of
The Lucas Machine Tool Company
Cleveland, Ohio

MANY times the simplest devices are the most effective. Every planer operator has lost time and been moved to profanity because he was unable to place his hand on the gib-screw wrench just when he needed it. When a ratchet wrench is supplied for each gib-screw, as shown in Fig. 1, the lost-wrench troubles are over. The wrenches are kept on the screws all the time.

In accurate planing a squaring plate is essential. The one shown in Fig. 2 is a toolmaker's job. The locating pins fit holes in the plate and in bushings set into the planer table. Pins, plate holes, and the bores of the bushings are lapped. No hammering is necessary, the fits being just right for insertion by hand when advantage is taken of the leverage provided by the handles shown. When the plate has been located, it is bolted tightly to the table.

Lapping spindle sleeves, a laborious and lengthy operation by hand, is made easy by the use of machinery. The lap, Fig. 3, is revolved between the centers of a lathe, while the sleeve is moved back and forth

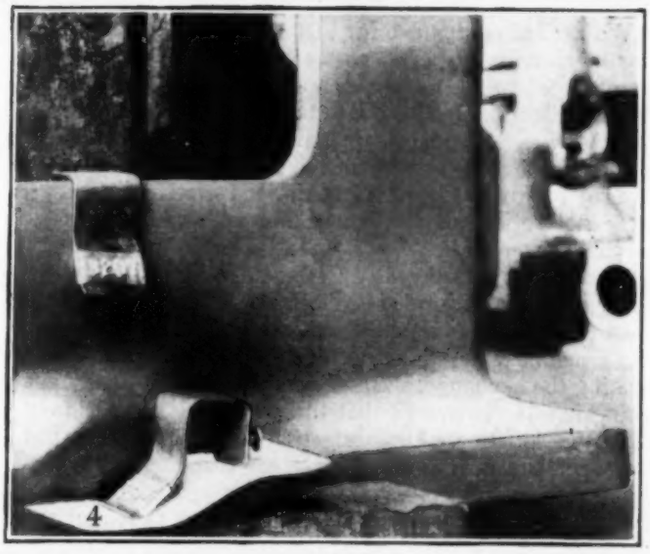


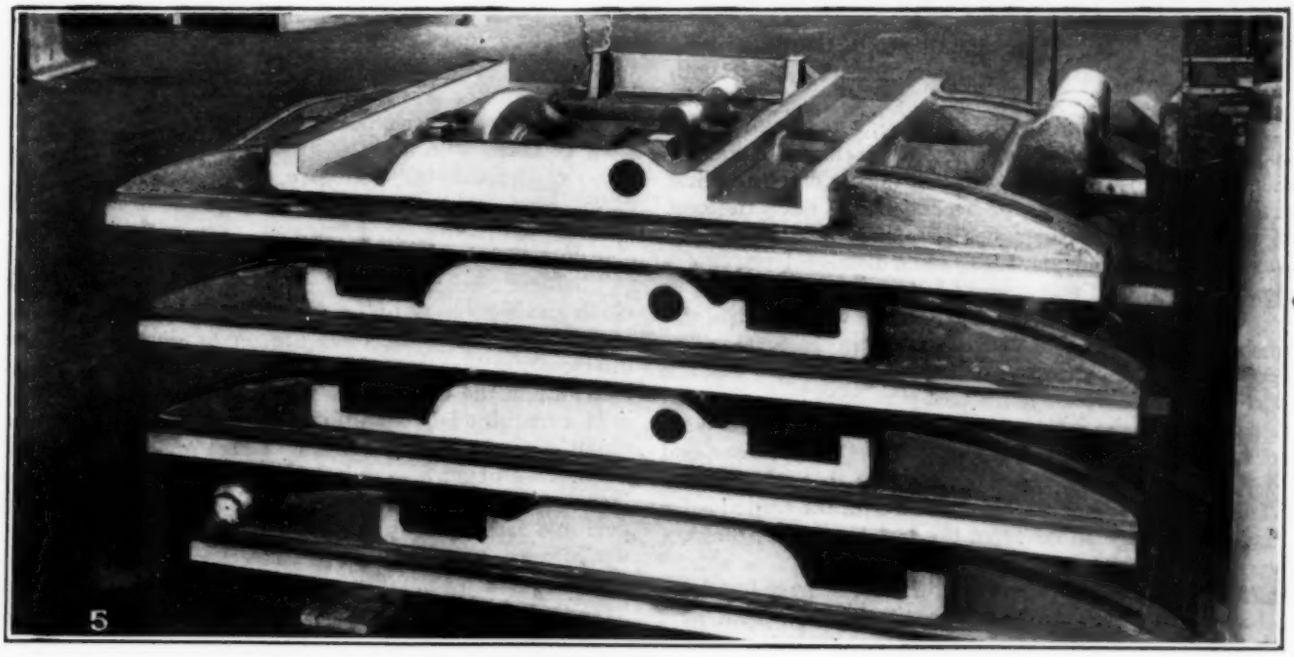


by the operator by means of the C-clamp. A spring support, suspended from the hook of a chain block, carries the greater part of the weight of the front end of the sleeve.

When order or serial numbers are chalked on machine bases or columns, they are likely to be rubbed off, or will show through the paint. The clip, Fig. 4, makes the chalking method obsolete. Being held to the casting by a screw, the clip can't get lost, and the stencil-cut number is thrown away after it has served its purpose. A slight bend near the end of the clip prevents the number plate from slipping off.

Piling castings is an art in itself, when there are no flat surfaces, or when such surfaces are all on one side. There is danger, too, in piles of delicately balanced castings. For safety's sake they can be spread over the floor if the floor space can be spared, or they can be stood on end against a wall or column. A better way is illustrated in Fig. 5. Feet, cast for the purpose, are machined flat while the castings are on the planer, set up for other machining. When the castings are piled, no boards are needed between them, and equilibrium is assured.





This Second-Hand Machinery Business
Discussion

By George W. Wilson

THE article on second-hand machine tools by Mr. Bath in Vol. 68, No. 2, of the *American Machinist*, prompts me to say something on this subject, which I have long intended to write about.

The difference in price between a second-hand tool and a new one is often a great temptation to the small shop owner who has to consider cost, especially when the dealer goes to great length to explain how carefully and thoroughly the tool has been rebuilt, or reconditioned. Naturally, one would expect a machine to perform about the same as a new one under these conditions, but when it has to be rebuilt to any extent my advice is to stay away from it. If one can pick up a practically new tool that needs no overhauling it is a different matter. I will give some experiences I have had.

A Fair Guaranty

We needed equipment for a small plant and as money was as scarce with us as with the usual small outfit we were forced to use some second-hand tools. We decided that rebuilt machines ought to be all right for our work, especially as the dealer explained how thoroughly the work was done and also that the tools were sold subject to trial for thirty days. If at the end of that time they were not satisfactory we need not accept them. This seemed fair enough.

Our first purchase was a 21-in. turret lathe of a well-known make. When this machine was set up it was found that the countershaft was not the one belonging to the machine and could not be used, causing delay in making the exchange. When the machine was finally got going it was discovered that the turret was $\frac{1}{64}$ in. lower than the spindle and investigation showed that the bed had been replaned in such a manner that the turret carriage did not fit the vees. In fact, a space of at least 0.010 in. existed between one of the bed vees and the carriage. A few days use of the machine had caused the turret carriage to lower by wear.

The matter was at once taken up with the dealer who offered to take the machine back and replace it with another. But we were out the cost of transporting the first machine back to the eastern city, a matter of some 500 miles, also freight on the second machine. Added to this was the cost of setting up and taking down the first machine and setting up the second one. Then the cost of transporting the machines to and from the railroad was not small as our plant was some distance from trackage. Altogether it was a sweet bill.

The second machine was a little more modern than the first, for which we had to pay an additional $200. The bed on this machine was a fit on the carriages but the portion against which the turret gibs bore had not been replaned with the bed so that when the turret gibs were set up so as to make the turret carriage snug at one end of the bed it was so tight at the other that it precluded setting up the gibs as they should be with the consequence that the carriage lifted from the bed sometimes under a heavy, uneven cut.

Another thing we found was that the turret had been rebored after planing the bed, as it should be, but with such a coarse feed on the boring tool that the insides of the turret holes were more like a fine thread, instead of the reamed surface they should present.

When we complained to the dealer he said, "Funny things can happen in a machine shop." We asked if it were right for his customers to have to pay for the funny work, to which he replied that he stood behind his guaranty, and would replace any tool that was not satisfactory. We figured that it was cheaper for us to overhaul the machine than to go through another moving process. This after we had been told that every machine was considered as so many rough castings before rebuilding. The dealer said he expected us to bush the turret holes, hence they did not need smoothing up. We did bush the holes but we had to rig up tools to bore them and spend considerable time on the job.

Our second purchase was a small boring mill, about 36-in. This machine had been refitted very well, but the turret holes had not been rebored at all and varied in size through wear so that the tools would not interchange in the holes in the turret when they had to be exact, as in boring bars with sized cutters and reamer shanks. Also the holes in the turret did not center over the table as the turret slide had been replaned but never adjusted.

We had several other experiences all along the same line, but these will serve to show what can happen. On the other hand we picked up some tools that had seen very little service that proved real bargains. But these needed no rebuilding.

The Buyer Pays the Loss

I do not mean that rebuilt tools are always unsatisfactory, but they were very much so in our case. It would make little difference whether or not the tools were seen before buying, as only use will show them up. The trial means nothing, especially if one is located at a considerable distance from the dealer, since the cost of returning the machine in case of dissatisfaction is borne by the buyer, and he will get along with the machine or tinker it up rather than go to this loss.

When a dealer says that the machines are considered as so much raw material before rebuilding, the statement must be taken with quite a little salt. The castings may be so considered, but there are things like feed screws, gears, keys and numerous other parts that are let go through in anything but a new condition, so that considerable doctoring is generally required from the purchaser.

The first owner usually gets the service out of a machine and the buyer of used stuff the grief. Especially is this true where the tools are on production and are used continually. For the job shop where the service is intermittent the used tool has a better field.

If a machine is reconditioned as it should be the dealer ought not to object to making a real guaranty, that is, in the case of an engine lathe, he should guarantee it to bore straight to within a certain limit, face square and perform satisfactorily in every way. But what dealer would agree to stand return charges on a machine that failed to live up to its guaranty? Better play safe and have the cream of the service out of a new machine.

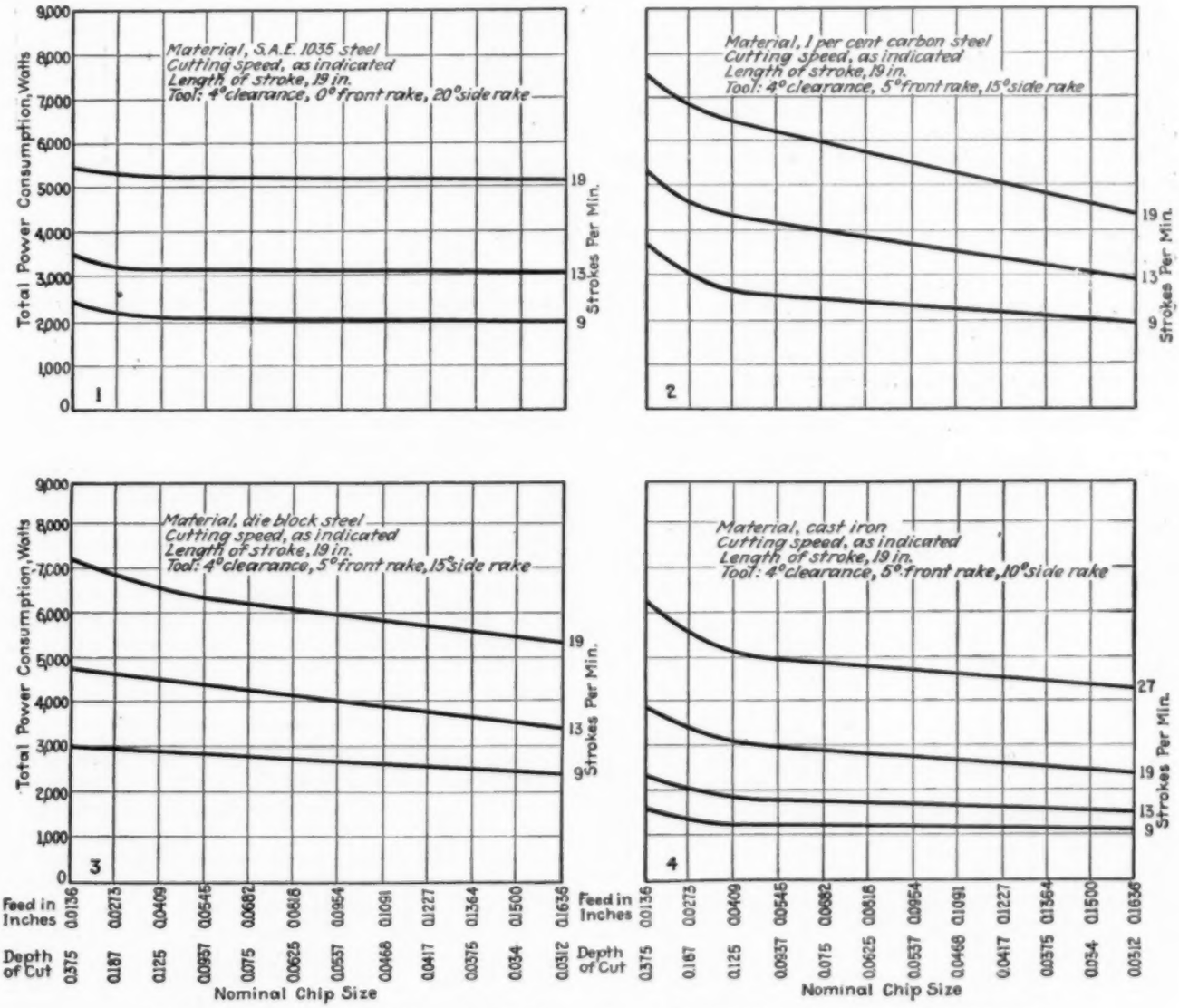
The Relation of Depth of Cut to Feed on a Shaper

By Donald L. Perkins
Assistant Professor of Shop Practice, University of Michigan

FOR a period of two years, the writer has been engaged in an investigation in "The Art of Cutting Metals" for the purpose of making recommendations of a practical nature relative to efficient straight-line cutting on a shaper. This work was suggested by F. L. Eberhardt, of Gould & Eberhardt, and this company generously contributed the machine and part of the material used in the tests. One of the problems undertaken was to determine on a power-consumption basis, the advantage or disadvantage of deep cuts with light feeds over shallow cuts with heavy feeds for different numbers of strokes per minute. The cutting speeds used were 9, 13, and 19 strokes per minute, and in the tests on cast iron, the additional speed of 27 strokes per minute was used.

The equipment consisted of a 32-in. "Invincible Type" Gould & Eberhardt shaper, motor-driven. Attached to the motor was a portable Esterline-Angus recording wattmeter equipped with suitable transformers to give a total reading on the chart of 10 kw. A chart speed of $1\frac{1}{2}$ in. per minute was used for the greater part of the experiments. In plotting each point on the curves shown the average wattmeter readings were employed.

The tools used were "Supreme" high-speed tools, $\frac{3}{4}$x$1\frac{1}{2}$x7 in. They were shaped as right-hand roughing tools and were ground with the following angles:


Material, S.A.E. 1035 steel
Cutting speed, as indicated
Length of stroke, 19 in.
Tool: 4° clearance, 0° front rake, 20° side rake
Total Power Consumption, Watts
Strokes Per Min.
19
13
9
1
Material, 1 per cent carbon steel
Cutting speed, as indicated
Length of stroke, 19 in.
Tool: 4° clearance, 5° front rake, 15° side rake
2
Material, die block steel
Cutting speed, as indicated
Length of stroke, 19 in.
Tool: 4° clearance, 5° front rake, 15° side rake
3
Material, cast iron
Cutting speed, as indicated
Length of stroke, 19 in.
Tool: 4° clearance, 5° front rake, 10° side rake
27
4
Feed in Inches
0.0136 0.0273 0.0409 0.0545 0.0682 0.0818 0.0954 0.1091 0.1227 0.1364 0.1500 0.1636
Depth of Cut
0.375 0.187 0.125 0.0937 0.075 0.0625 0.0537 0.0468 0.0417 0.0375 0.034 0.0312
Nominal Chip Size

Figs. 1, 2, 3 and 4—Relation of chip size to power consumption for various materials cut

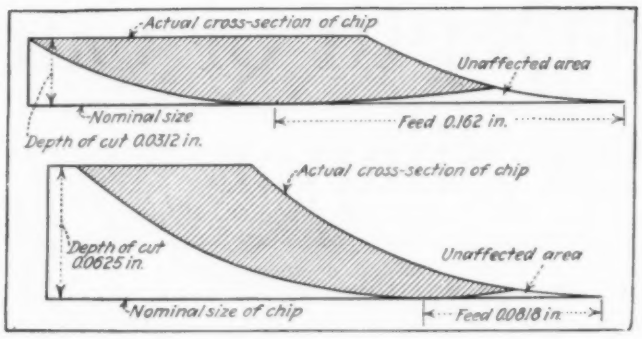


Fig. 5—Comparison of nominal and actual chip sizes for two combinations of depth of cut and feed

For use on soft steel:	Clearance	4 deg.
	Front rake	none
	Side rake	20 deg.
For use on hard steel:	Clearance	4 deg.
	Front rake	5 "
	Side rake	15 "
For use on cast iron:	Clearance	4 deg.
	Front rake	5 "
	Side rake	10 deg.

Four different classes of material were selected for use:

1. Heppenstall grade "X" annealed die-block steel obtained in forgings 4½x5x18 in.
2. Columbia standard tool steel, annealed, obtained in bars 4x6x18 in.
3. S.A.E. 1035 steel, cut from a bar 4x6x48 in.
4. Cast iron, cut from bars 1¾x4x48 in., all cast from one ladle.

The material was cut exactly 18 in. long. The length of the stroke was adjusted for $\frac{5}{8}$ in. clearance at the beginning of the stroke and $\frac{3}{8}$ in. clearance at the end of the stroke. The material was clamped in the vise with the jaws parallel to the ram. A ¾-in. bolt was inserted through a hole drilled 3 in. from the end of the bar and 1 in. from the bottom. This bolt prevented the material from moving in the vise away from the tool.

After considerable preliminary work had been done, the maximum depth of cuts was fixed at $\frac{3}{8}$ in. Using the actual power feeds available, the twelve depths of cut were calculated to give a constant nominal chip area. The depths of cut, feeds, and ratio of depth of cut to feed were as follows:

	Depth of Cut	Feed	Ratio
1	0.375	0.0136	27.6:1
2	0.187	0.0273	6.8:1
3	0.125	0.0409	3.1:1
4	0.0937	0.0545	1.7:1
5	0.075	0.0682	1.1:1
6	0.0625	0.0818	1 :1.3
7	0.0537	0.0954	1 :1.8
8	0.0468	0.1091	1 :2.3
9	0.0417	0.1223	1 :2.8
10	0.0375	0.1364	1 :3.6
11	0.034	0.1500	1 :4.4
12	0.0312	0.1636	1 :5.2

The results of the tests are plotted in Figs. 1, 2, 3 and 4. The charts clearly show the advantage, in total power consumption, of shallow cuts with wide feeds over deep cuts with light feeds. Of the four materials cut, S.A.E. 1035 steel is the least affected by the relation of the feed to the depth of cut, while the most affected is 1 per cent carbon steel, particularly at the highest cutting speed of 19 ft. per min. It is worthy of note that at the most efficient chip size, formed by a combination of small depth of cut with a high feed, the power consumption for the three grades of steel is about equal. As would be expected, the power consumption with cast iron is much lower, in this case about one half the corresponding value for the steels.

In Fig. 5 is shown the chip cross-sections for a chip whose depth of cut is 0.0312 in. and feed 0.162 in. and for a chip whose depth of cut is 0.0625 in. and feed 0.0818 in. It can readily be seen that the nominal area of the cross-sections differs from the actual area by the amount of area unaffected by the cutting tool. The figures are based on the use of a tool with an extreme nose radius of ¼ in. and a front angle of 4 deg. An increase in the nose radius would decrease the size of the unaffected area while an increase in the front angle would greatly increase the size of the unaffected area. This figure also shows that the chip removed by a shallow cut with a wide feed has a more uniform cross-section than a chip removed with a deep cut and light feed.

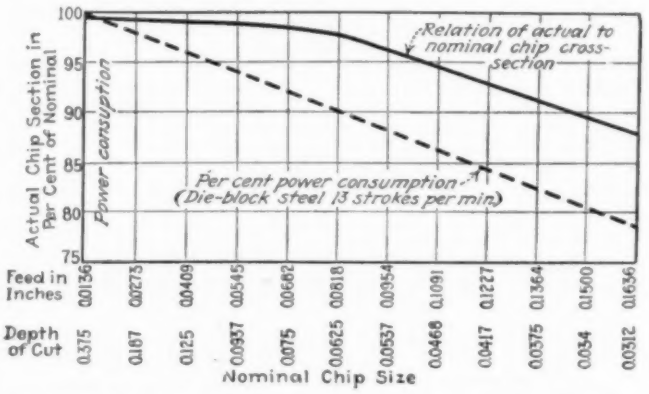


Fig. 6—Relation of actual to nominal chip cross-section for all combinations of feed and depth of cut used in the tests

Note that the unaffected area is larger for the shallow cut, and, consequently, a rougher surface is left by the cutting tool. This effect would not be a serious drawback, however, in roughing work.

In Fig. 6 the actual chip size in per cent of the nominal chip size is shown for the different combinations of depth of cut and feed. Fig. 6 also shows the per cent decrease in power consumption when cutting die-block steel at 13 strokes per minute. This decrease is typical of the decrease in power consumption for the other materials. From the curves it is evident that the percentage of actual area cut is less for the shallow cuts with wide feeds, but that the per cent reduction in power consumption is in greater proportion.

While electric and flame welding have made great strides in the past few years, there still are many problems to be solved. One such problem is the welding of Duralumin shapes and sheets as used in airplane construction. Duralumin can be welded of course, but in order to restore the strength of the metal the whole welded structure must be heat-treated, as the heat of welding weakens the metal materially. On this account a tremendous amount of riveting is still necessary. A recent airplane (not one of the largest) has 75,000 rivets in the construction of wing ribs, ailerons, elevators, rudders, and other parts.

Activity in the Metal Working Industries

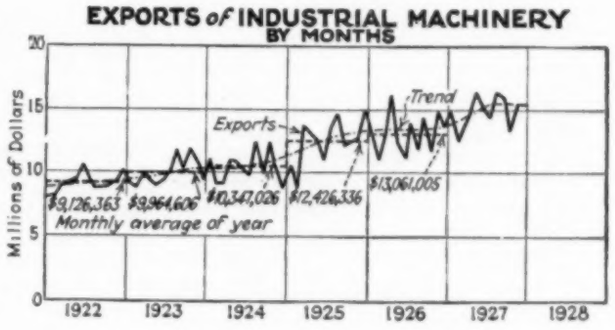
Upward Trend During January

That the opening month of the year showed slightly increased operations in the metal-working industry is indicated from preliminary reports of electrical energy consumption during that month. January rate of activity, however, appears to have been about 2.2 per cent under that recorded during January of last year.

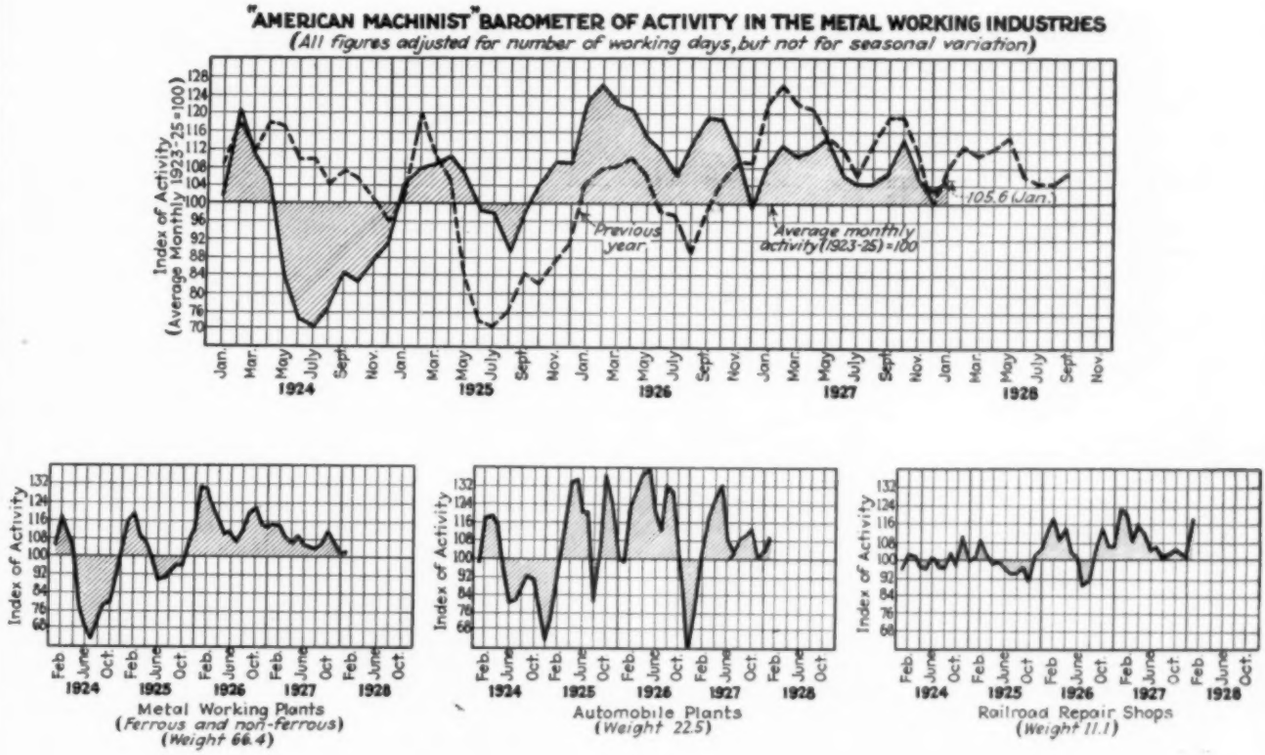
The index of activity in the metal working industry based on the consumption of electrical energy stands at 105.6 for January as compared with 103.9 for December. Comparative indices of productive activity in these plants referred to the average activity for the period of 1923-1925 as 100, and adjusted for number of working days, are as follows:

January, 1928,	105.6
December, 1927,	103.9
November, 1927,	105.6
January, 1927,	108.0
Average for full year 1927,	119.2
Average for full year 1926,	117.0

The year opened with the rate of operations in the ferrous and non-ferrous working plants about 2.6 per cent over those of the previous month, but about 10 per cent under January, 1927. On the other hand, electrical energy consumption by automobile manufacturing plants, including those manufacturing automobile equipment and replacement parts, indicate that the January operations of these plants was about 60 per cent over January, 1927. The manufacture of replacement parts has been a very important phase of that industry's operations.



Exports of industrial machinery during 1927 reached a total of $180,000,000, and exceeded shipments for any year since the abnormal post-war trade, according to figures from the United States Department of Commerce. Compared with the 1926 total, this trade represents a gain of 15 per cent.



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· TECHNICAL · ABSTRACTS ·

Specifying Tool Steels

Companies with no metallurgical control who realize the need of having at least one definite factor present in their tool steel should determine from some of the tools that have stood up exceptionally well in their shop either the chemical analysis or certain physical properties of the most importance to each tool, and affix one at least requirement—chemical, physical of microscopical—to each in order to make reasonably sure of maintaining the quality of their tools when re-ordering material.

There are as many, if not more, different compositions in straight carbon tool steels than there are suppliers, and, to be exact, no two heats of steel will be the same. From this we may conclude that if the purchaser specifies a steel to have a definite chemical analysis, it will be far more satisfactory than to try by special heat-treatment to bring material of general grade up to standard. —*Heat Treating and Forging,* February.

German Machine-Tool Industry

A steady improvement was shown in the German machine-tool manufacturing industry in 1927 over 1926. The German manufacturers of machine tools are banded together into an association, Verein Deutscher Werkzeugmaschinenfabrikanten. This association acts as chairman of the first subsection of the National Machinery Builders' Association, and controls the production of 125,000 workmen. This subsection in turn forms a sub-group of the National Economic Council, which controls 93 per cent of all German machinery building factories, employing a total of over 700,000 workmen. The organizations collectively handle the large problems of the manufacturer, leaving him free to devote his energy to the details of manufacture. This arrangement brings the whole pyramid of German organization to the machine-tool factory door.

There are in Germany about 865 factories devoted to the manufacture of metal-working machinery. The three most important districts are: East Thuringia—Saxony; Westphalia—Rheinland; and Wurttemberg—Baden.

German metal-working machinery manufacturers have in recent years made great inroads on the British markets, especially in the cheap and middle grade of machine tools. Since the completion of the Franco-German trade treaty in September, 1927, German metal-working machinery exporters have been rapidly developing the French market. German shipments of machine tools to Russia in 1927 were well over 13,000 metric tons, which amount exceeds even the best pre-war record. German exports of metal-working machinery to the United States have been estimated at 2,200 metric tons in 1927, which is more than was ever sold to the United States before, even in pre-war days.

A German magazine has recently compiled statistics showing that Germany's exports of machine tools are rising at a much more rapid rate than those of either the United States or Great Britain. The German scale of wages is one of the important factors in German expansion of foreign trade. American wages are approximately three and one-half times the corresponding German wage. Furthermore, the American public has loaned Germany about $770,000,000 in the years 1924 to 1927. An important portion of this loan has gone to assist German manufacturers in extending some of the long credits for which they were famous before the war.—*Commerce Reports,* Jan. 30.

What Is Employee Representation?

Industrial management in an industry is simply leadership, and leadership is absolutely essential whenever it becomes necessary to co-ordinate and direct the efforts of two or more individuals. I can not escape the conclusion that the use of the term "management sharing" in connection with employee representation plans is either ill considered or insincere.

Employee representation is a new and additional form of organization in industry. Its adoption constitutes recognition of certain things not previously recognized or fully appreciated by management. First, the military form of organization in industry is not adequate for promoting, developing and maintaining the best relations between management and men as individuals. Second, the worker is entitled to a better status in the industry than that of being a mere servant or a mere contractor. Third, the worker ought to be considered and treated as a part of the organization just as much as an employee who happens to carry the title of supervisor. Fourth, as a part of the organization, as a part of the industry, the worker is entitled to confer with responsible representatives of the management concerning his own relations to the business and everything involved in that relation. Fifth, he is entitled to know and ought to know something about the plans and the procedure, the practices and the objectives of the industry itself, and he is entitled to have a chance to do this and to ask these questions without seeming impertinent or feeling embarrassed or being told that it is none of his business As a matter of fact, management assumes responsibility for taking the initiative in telling employees about these things. Sixth, where size prevents this contact between representatives of the managing employees and all the members of the general working forces, then an orderly method to accomplish these ends is for the general forces to confer with management through representatives, through people whom they select, their own side partners, people who are more or less working under the same conditions they are working under in the business.—*Personnel,* February.

Economical Gas Cutting

Economy in oxyacetylene cutting is dependent upon several factors: first, the stream of oxygen must be pure. The importance of this factor is now so universally recognized that oxygen of 99.5 per cent purity can be secured almost anywhere. Next in importance is the matter of equipment or apparatus. The cutting process subjects the apparatus to severe conditions and it is, therefore, essential that careful consideration be given to construction and durability. Unless the equipment is able to stand up against the abuses received, it will be continually out of repair. Regulators should be of a type that are capable of passing large quantities of oxygen at pressures suitable for the heaviest cutting. The hose should be of the best quality to withstand the wear and tear that it receives.

Next in importance is the factor of supervision. Unless a definite procedure is laid out, each operator will select his own size of tip, cutting speed, and oxygen pressure with the result that all kinds of economy will result. The average ratio of oxygen cost to labor cost is about 3½ to 1, not considering overhead, so that the conservation of oxygen is paramount. A small tip, medium pressure, with the fastest possible speed consistent with actual cutting, is recommended. The cutting lines should show an appreciable amount of drag because as the cutting lines more nearly approach the vertical, the cutting operation becomes more costly for the reason that much unconsumed oxygen is passed out of the cuts. The drag should not be exaggerated, however, as the kerf will then become ragged.

The cutting work should be planned and laid out and instructions given on the requirements of the job so that the operator can proceed with his work with a thorough understanding of what is expected of him in the matter of production and quality. Segregation of the work should be undertaken so that each operator can proceed from job to job without frequent changes in tip sizes. This plan may involve more handling of material, but a close study will indicate that handling material is less costly than the unnecessary use of oxygen.—J. C. Anderson, *Journal of the American Welding Society,* January.

In Defense of the Blind Ad

By Frank E. Lewis

EVERY now and then the subject of blind advertisements crops forth, usually in the form of criticism. The last one which I read closes with a challenge for "anyone to step forward who has benefited through blind ads." Having used this means of securing positions and help, I believe that I am qualified to discuss the subject.

I agree that a large percentage of blind advertisements are vague. I have seen many that give little idea of the kind of position open, and may not even mention the line of industry, though it is expected of the applicant that in his first letter he send references, give complete record of his qualifications, and state salary expected. The chances are that the applicant receives no acknowledgment of his letter, and one can hardly blame him for becoming a critic of blind advertisements in general.

On the other hand why did the applicant answer the advertisement in the first place if it was too vague, or if it asked for information which he did not think should be required in the first letter? Why waste time and postage on a firm of which you have a poor impression at the very start?

Good Connections Made

My experiences with blind ads have been satisfactory. Some fifteen years ago a blind ad which I inserted in the "men available" column in the monthly journal of one of the professional societies resulted in a connection which proved pleasant and satisfactory. After a few years I left the position to accept an offer which seemed to provide greater opportunities. Certain factors were not such that I would care to spend the rest of my life with this firm, so I again tried the blind ad while still employed—this time in the *American Machinist*. I received several favorable replies, and accepted one of the positions after a personal conference. The affiliation turned out to be a satisfactory one, and in it I often had occasion to use blind ads, but now "on the other side of the fence," as the employer.

I hired a sales engineer through a blind ad, and over a period of several years he stood third from the top among our twenty-eight salesmen all over the country. When the foreman of the maintenance department left, I secured a new foreman through a blind ad. Likewise, I secured a time-study man who had ideal qualifications for the position. He has now been with the firm for ten years.

I could give numerous other instances of satisfaction resulting through blind ads. Sometimes an interview with an applicant reveals that he would be more valuable in a better position than that for which he applied. Once, when I advertised for an assistant for the tool crib, one of the many who answered the ad had been for years the master mechanic for a large plant. He had purchased a farm near the city where our plant was located, but the life seemed lonesome, and he desired to get back into a plant near his farm. Needless to say we found a more responsible job for him. He is still with the firm, as one of its best foremen. The men who were obtained through blind ads were "stickers," and not floaters, as has been so often claimed to be the experience of those who have written on the subject.

I tried open advertising, and life was made miserable by the large number of unqualified applicants who called and who telephoned. The inclusion of instructions to apply by letter only had no effect whatever.

Many unusual situations result from the use of blind ads, and sometimes they prove embarrassing. For instance, we needed a general superintendent. The manager put it up to me to find several qualified men from whom to select. My first step was to answer a well written ad, of a man available. From the information given the advertiser appeared to have exactly the qualifications which we were seeking. So I wrote him, telling about the position, the company, and the product. I received no reply, but thought nothing about it. In a few weeks the superintendent whom the manager had originally hoped to promote, resigned, and after the man had left town I learned that the blind ad which I had answered was his.

Among the replies to an advertisement which I published, was one from one of our former employees. He had been with the company when the present production control system was installed, and among other exaggerations, he stated that he had devised and installed the system.

If the critics could sit down and read some of the letters that come from applicants, and if, perhaps, their own letters were analyzed for them from the viewpoint of the employer, their attitude would probably be different. To state it briefly, satisfactory results can only come from blind advertising when the employer puts himself in the employee's place when he advertises, and when he considers applications, by stating as fully and clearly as possible the essentials about the position and its requirements. Likewise, the applicant must consider letters from the viewpoint of the employer, stating concisely the full details that he himself would want to know from an applicant, under the circumstances.

Armor Plate Rivets Developed

RIVETS having a resistance to projectiles exceeding that of light armor plate and four or five times the strength of ordinary carbon steel rivets have been developed by the Bureau of Standards, Department of Commerce, in co-operation with the War Department.

In addition to tests to determine the shear and tensile strengths of the steels, actual firing tests were also carried out to determine their resistance to penetration of projectiles. Although it had only been hoped to produce rivets which would tend to approach the resistance to penetration of projectiles such as is producible in light armor plate, tests proved that rivets were produced which excelled such armor plate in resistance to armor piercing projectiles. The commonly used physical tests further showed these rivets to possess four to five times the strength of ordinary carbon steel rivets and more than twice the strength of high-grade nickel steel rivets such as are used in bridges. A complete description of this investigation has been published as Technologic Paper, No. 358, of the Bureau of Standards, and can be secured from that department at Washington, D. C.

Machinery Aids the Astronomer

Photographs submitted by John Homewood

Fig. 1—The engineering department of the Mount Wilson Observatory, located at Pasadena, Calif., twelve miles from the summit of the mountain. The buildings house a drafting room, machine shop, and physical and optical laboratories

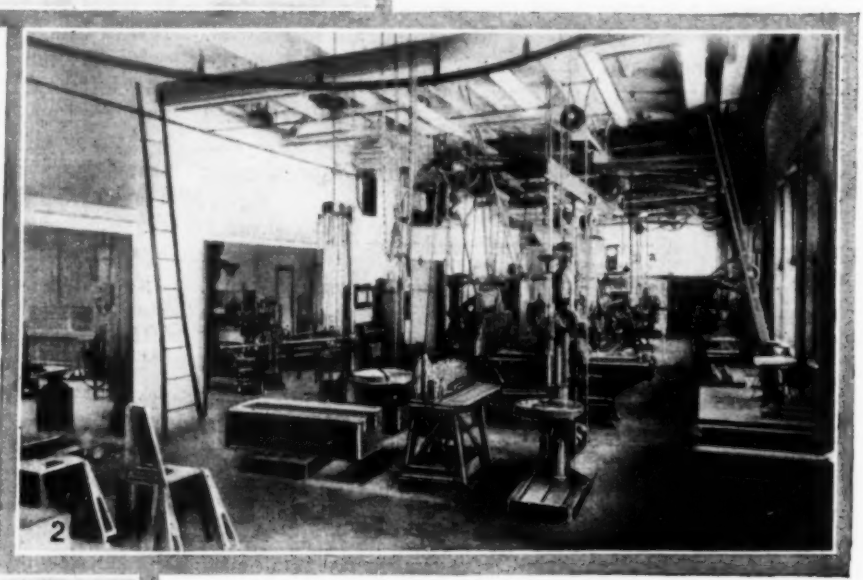


Fig. 2—A view in the machine shop. It has a very full equipment of machine tools and special fixtures for handling "freak" jobs. Most of the fine, special parts of the astronomical instruments are made in this shop

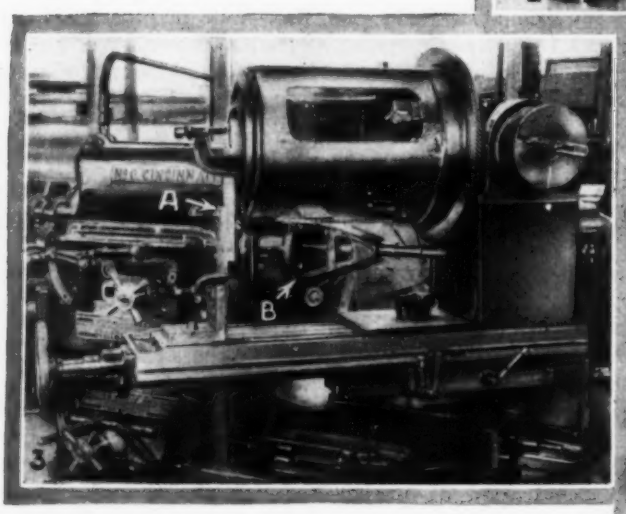


Fig. 3—Cutting the 2-ft. spiral gear for the spectroscope. The cut is made underneath, and the heavy casting is supported at A. The dividing head is raised from the table, and a special faceplate was provided for the dividing head. A cantilever-type arbor support, B, was made and bolted to the column of the miller

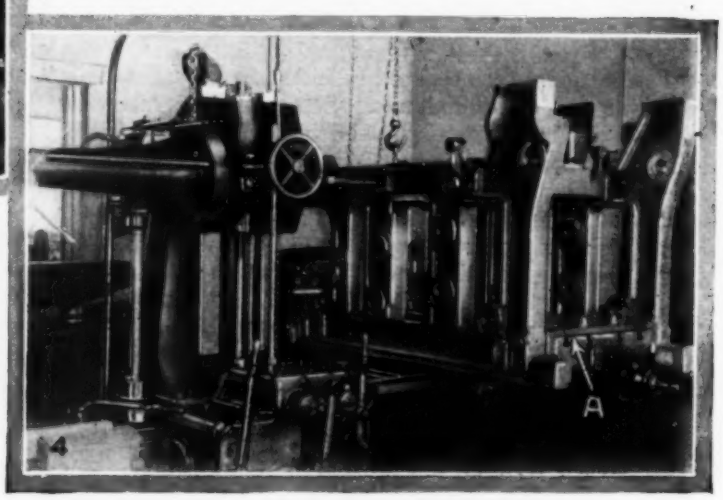


Fig. 4—The set-up for boring the driving clock frame. A special base A was made to hold the frame on the boring mill table

Fig. 6—Cutting a large, accurate wormwheel on a small milling machine. The wheel was clamped to the rotary milling table, resting on wedges to suit the angle of the piece. The wheel was gashed, the wedges removed, and the gear hobbed

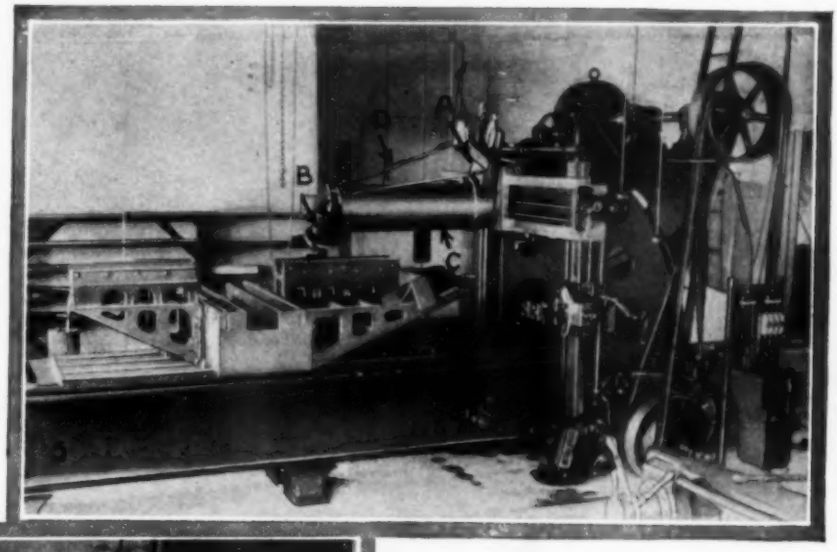
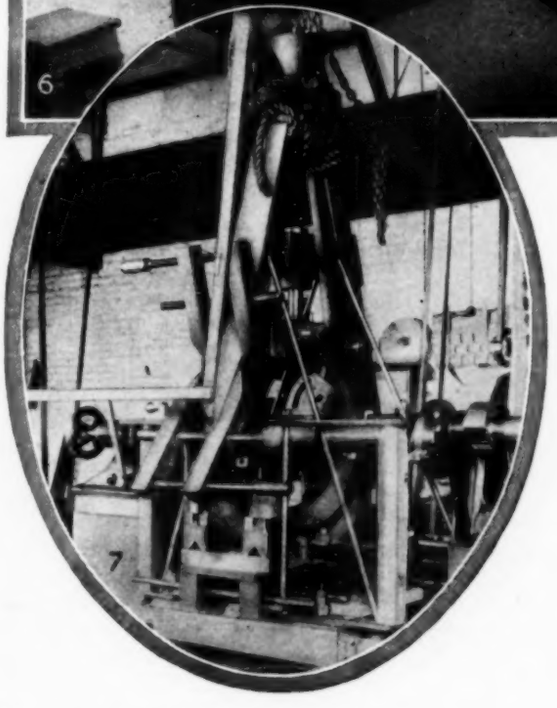


Fig. 7—Boring the declination arm for the 60-in. telescope. The weight of the casting was 600 lb., and it was supported and clamped in the manner shown

Fig. 5—Grinding the hardened steel rails on the machine for ruling the diffraction grating. A special slide, A, was made for the planer to hold the electric grinder B, supported at the end of a piece of oil-well casing, C, braced by the rod D

Fig. 8—The heavy base of the 10-in. refractor being bored on a horizontal boring mill. "Every job a different problem" is a feature of this shop



IDEAS · FROM · PRACTICAL · MEN

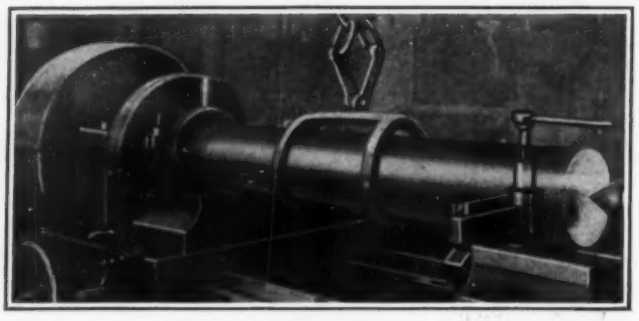
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

Tongs for Holding Driving Axles

By Milton Wright

At the Billerica shops of the Boston & Maine Railroad the tongs to be seen in the accompanying illustration are employed to handle driving axles of locomotives into and out of the lathe. The shape of the tongs is such that when the weight of the axle is suspended from them they are caused to grip it more firmly.

The tongs possess two advantages over the rope or chain slings commonly used for this purpose. They are more quickly applied, and when an axle is to be lifted



Tongs for lifting driving axles

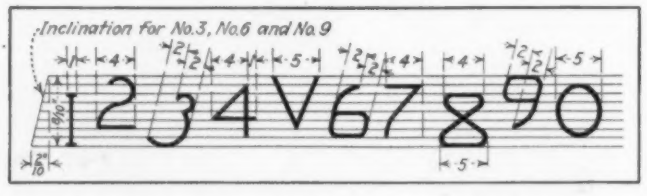
from or deposited upon the floor it is not necessary to bar it up in the one case or to deposit it upon blocking in the other in order to make room for a rope or chain to be passed under it.

The axle is grasped at two points a considerable distance apart, so there is no need to balance it accurately in order to prevent it from sliding out, and it is presented in a nearly or quite horizontal plane to the centers.

Numbers for Patterns and Castings

By Walter J. Hearne

Considerable difficulty is often experienced in reading numbers stamped on metal objects exposed to the weather or subjected to mechanical injury. This difficulty has often occurred with steel rails, the numbers being sometimes partially obliterated. Numbers as



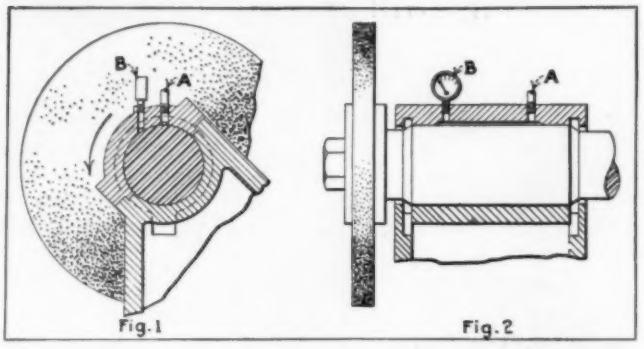
Numbers that are not likely to lose their identity

shown in the sketch are being used by some railroads to overcome this trouble, as should a number become damaged, it can readily be identified by its location and angle. Owing to the dissimilarity of the numbers shown, there is little danger of one being mistaken for the other. This system of numbers could be used to advantage on wood or metal patterns, or in any case where the numbers are likely to become worn and hard to decipher correctly. The dimensions shown on the sketch are in tenths of an inch and are for stamps cut on 1x$\frac{5}{8}$-in. stock.

Improvement in High-Speed Bearing Lubrication

By Warren F. Frazer

In grinding and other machines embodying high-speed spindles, the method of lubrication of the bearings of the spindles is a matter of considerable importance. It is also equally important to provide some visible means of indicating at all times whether or not the lubricating system is doing its duty. For this class of work pressure or forced lubrication is one of the best methods, but



Figs. 1 and 2—Methods of placing gage to show oil pressure

with this method sight glasses are not good indicators, as, being full of oil, they are not easily read by the attendant.

The accompanying illustrations show an improved indicating means as applied to a grinding machine spindle that is driven from below, as is the case in most modern designs.

In Figs. 1 and 2, *A* is the oil pipe supplying oil under pressure to the slack or low pressure side of the bearing, while *B* is a pressure gage also connected to the slack side of the bearing, either as in Figs. 1 or 2, so that the spindle forms part of the wall of the passage leading from the oil supply to the gage.

Small pressure gages are obtainable at very small cost and are plainly read at a glance. When placed as shown,

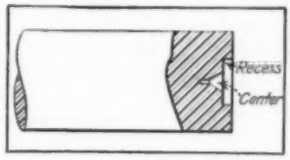
it is self-evident that a gage will indicate the pressure under which the oil actually reaches the bearing, and will not show the pressure that may exist at any other point in the oil line. Under no circumstance can the gage show pressure unless such pressure is actually present in the oil at the bearing itself, so that failure of the oil for any reason to reach the bearing, will be at once indicated by no pressure on the gage.

Turning Shafts That Are Not Centered *Discussion*

By J. T. Towlson
London, England

In an article under the title given above, on page 706, Vol. 67, of the *American Machinist*, I. B. Rich gives a practical method of dealing with uncentered shafts, providing that dead accuracy is not demanded.

With the cap and split bushing, Mr. Rich is precisely in the position that would obtain had he gripped the shaft in an ordinary four-jawed chuck, putting pieces of brass between the jaws and the shaft. In the majority of cases, the screws in the cap would have to be adjusted to get the shaft to run dead true.



Recess to protect the center

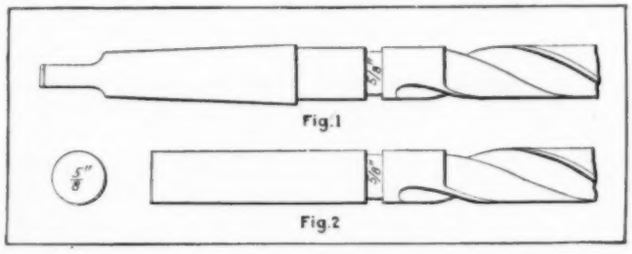
My practice would be to center, or recenter, the shaft, holding one end in the chuck and truing it by an indicator. The other end would be held in the steadyrest. All shafts should be faced to length before being centered, and a recess should be made to prevent the center from being damaged, as shown in the sketch.

Marking Drill Shanks—*Discussion*

By R. G. Hewitt
Yorkshire, England

In an article under the title given above, on page 508, Vol. 67, of the *American Machinist*, Edwin D. Anderson voices the complaint that the size marks on twist drills are obliterated by slippage in the drill chuck, and suggests that the makers of drills should find some way to correct the matter.

I am in agreement that some better method of marking drills should be devised, and would suggest that taper-shank drills be grooved near the flutes, as shown in Fig. 1, and that the sizes be stamped in the grooves.



Figs. 1 and 2—Methods of marking sizes on drills

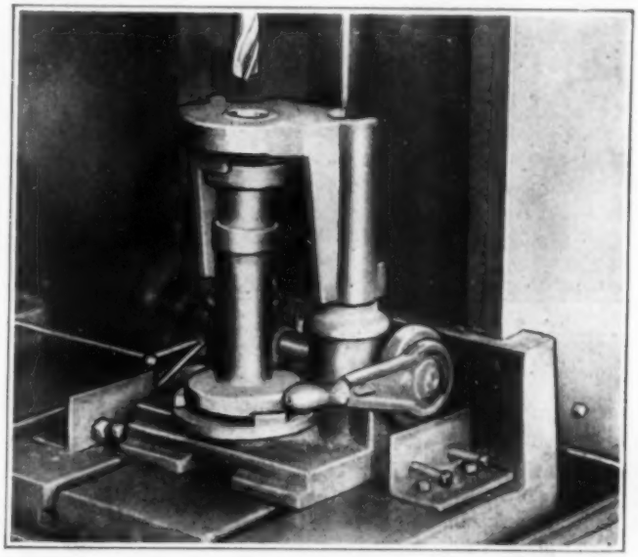
In straight-shank drills, in addition to marking them in the grooves, the size could be marked on the ends, as shown in Fig. 2. When stored on shelves this method would be of value, since the sizes could easily be seen.

Drilling Jig for a Cluster Gear

By Frank C. Hudson

The jig shown in the illustration is in use in the shop of the Warner Gear Co., Muncie, Ind. It is used in drilling a hole through the center of a long, cluster-gear forging. The jig centers and holds the forging accurately and easily.

The lower end of the forging rests on three inclined surfaces, and there are three similar projections on the under side of the upper portion that carries the drill bushing. This portion of the jig swings on a substantial post at one side, and can be raised and swung out of the way for removing or replacing the work.


Jig for centering and holding a cluster-gear forging

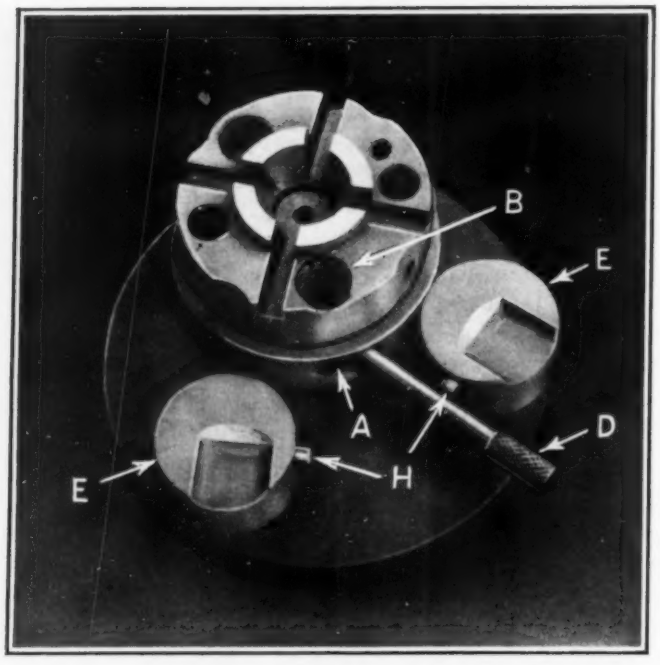
After the work is in place, the bushing plate is swung in position and is drawn down by a cam operated by a lever near the base. The two sets of inclined surfaces center the forging at each end, and by drawing down the upper part, the work is firmly held during the drilling operation.

An Indicator Gage

By O. S. Marshall

In the work shown in the illustration, the slot *A* requires close limits and accuracy of location in relation to the member of which it is a part. When finished, a lever operates therein, the amplitude of its movement being controlled by the ends of the slot. The lever swings through an arc, the center of which is the center of the hole *B*, and the slot is located from this hole. To accurately gage this slot remained a difficult problem for a long time, being successfully solved recently by means of the indicator gage shown in the illustration.

The body of the work is located on the fixture by its main central hole and the hole *B*, in which latter hole is a stud having a hole for the small lever *D*. Prior to the making of this gage, a similar one had been used, having fixed studs against which the lever *D* should hit at the two extremes of the arc. In the new gage, the two large studs *E* are screwed firmly to the fixture, and are provided with spring-actuated pins *H*. The portion of



An indicator gage

these pins within the studs is of larger diameter than the projecting ends that encounter the lever *D*, while abutment screws at the opposite end keep them and their actuating springs in place.

The studs *E* are milled away as shown until the registering pins *H* are exposed for ¾ of their length within the holding studs, and each has a fine line around it for the index line. At the correct position on each stud *E* there are scratched three lines, the middle one being marked go, while the others on each side give the plus or minus tolerance that may be allowed.

Gage for Setting Boring-Bar Cutters
Discussion

By Arthur Silvester

Judging by the comments on articles under the title given above, several of which have lately been published in the *American Machinist*, the subject has more than usual interest. All the writers claim, by one method or another, that cutters can be set to bore a predetermined size within very close limits.

Cutters set by any of the methods advocated would bore to size if the bars ran true. Since very few of the bars, and comparatively few of the spindles of boring machines, run absolutely true, cutters will generally bore holes larger than those for which they are set.

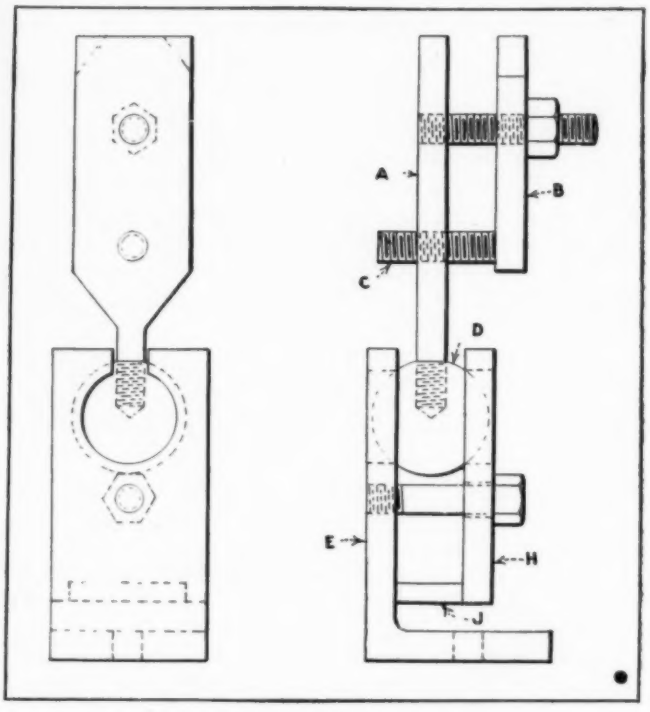
In some work it is necessary to use short bars that, owing to the nature of the work, cannot be supported at the outer ends. Such bars usually have taper shanks that are smaller than the holes in the spindles, necessitating the use of one or more collets. While the collets may have been true when new, use and abuse has made them run out. Boring bars held by collets very seldom run true, so that if their cutters are set to bore predetermined sizes, either by gages or by measurement, the holes bored will be larger than was intended.

I have a micrometer device for setting boring bar cutters, and in using it I always set the cutter to bore small, according to the amount the bar is out of truth.

An Adjustable Holding Fixture

By P. H. Pearson

It is often necessary to hold work in many conceivable positions. This is impossible in the ordinary vise. The accompanying sketch shows a fixture in which the work can be held in any desirable position. The work is clamped between the jaws *A* and *B*. The screw *C* is adjustable, to compensate for the various thicknesses of the pieces to be held. One end of the jaw *A* is turned,



An adjustable holding fixture

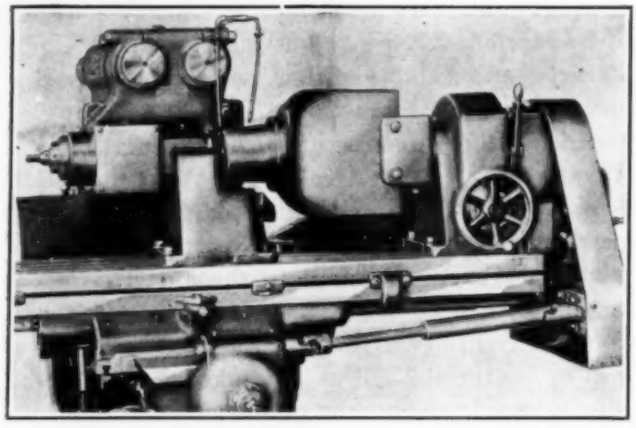
threaded and screwed into the sphere *D* in which it is pinned. The bracket *E* and strap *H* have holes approximately 75 per cent smaller in diameter than that of the sphere. The bracket *E* has a slot at the top ⅛ in. larger than the diameter of the threaded end of jaw *A*. The block *J* supports the end of strap *H*. The bracket can be bolted to the bench and the jaws can be turned in any position to either side or through the slot in the front.

Fixture for Hobbing Tapered Threads

By George H. Feltner

By equipping a No. 3-heavy Milwaukee milling machine with a special spindle head and a fixture, as shown in the illustration, hobbing tapered threads on oil-well bits has been somewhat simplified over a former method. The bits, made of chrome-nickel steel, are required in several sizes. The taper thread for the larger size is 4 pitch, 2½-in. taper per ft., and for the smaller size it is 5 pitch and 3½-in. taper per ft. The hobs are 5 in. long and have the same taper as that of the work.

In order to compensate for the angle of the taper, the cross-feed screw of the milling machine is geared to the table feed so that as the table feeds to the right, the saddle moves inwardly, the ratio being such as to keep the hob cutting to the same depth at all times. Change gears are provided to alter the longitudinal table travel



Cutting tapered threads in a plain milling machine

for threads of different pitches, as well as to change the cross travel.

In setting up, a gage is used to determine the correct setting by measuring the distance from the face of the hob to the shoulder of the bit. Then, by means of a hand crank on the crossfeed screw, the piece is fed into the hob to the proper depth of 0.162 in., as measured on the micrometer dial.

Dimensioning Drawings—*Discussion*

By Emile H. Dion

In an article under the title given above, and published on page 703, Vol. 67, of the *American Machinist*, John Hardecker questions the merits of the two-dimension system as proposed by Frank C. Hudson, on page 442 of the same volume. Mr. Hudson's proposal is to use the high and low limits for dimensions, omitting the mean dimension, thus $\frac{2.751}{2.750}$, whereas Mr. Hardecker favors the unilateral system, as $2.750\ ^{+0.001}_{-0.000}$, dwelling upon the importance of giving the mean dimension, so that the mechanic need remember but one main dimension instead of two.

In the establishment where I am employed, the system advocated by Mr. Hudson has been used successfully for a long time. Where the standard-hole system is used, it has many advantages, for the hole, slot, or recess is given as one flat dimension, as for example 2.000, and dimensions are given to the highest and lowest limits on all external parts according to the class of fit desired, namely $\frac{2.002}{2.0015}$ for a press fit, etc. For these figures, the mean dimension would extend into five decimal places.

The advantages of the two-dimension system are quite manifest. It gives the mechanic at a single glance the highest and lowest dimensions he can work to, without the need of any mental arithmetic on his part, and saves errors due to wrong addition or subtraction of limits, which can easily arise in cases where awkward dimensions and limits are given, as $3.7798\ ^{+0.0011}_{-0.0009}$. It also saves time in production, for many a workman will spend more time than necessary in striving to work to the mean diameter only, disregarding the plus and minus limits. In rare instances we use all three as $1.000\ \frac{1.001}{1.009}$, where a mean dimension is necessary.

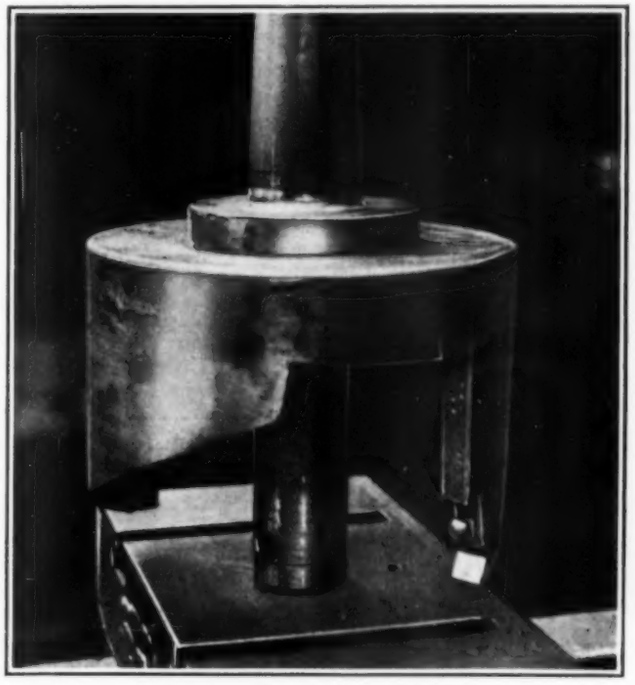
In my opinion, the drafting-room is better adapted to determine all the mathematics of a job, no matter how simple, leaving the mechanics' minds free to dwell upon other matters pertaining to their work. Having once overcome the strangeness of the newer system, draftsmen and mechanics will welcome the two-figure method of dimensioning drawings.

A Trepanning Tool for Locomotive Side Rods

By Ellsworth Sheldon

In making new side rods for locomotives at the Billerica shops of the Boston & Maine Railroad, the holes for the bearing bushings in the ends of the rods are cut out by trepanning tools of the kind shown in the accompanying illustration, leaving but a small amount of stock to be taken out by a boring tool. The work is done on a Newton double-head boring machine so that the hole in both ends of a rod may be made at the same time.

A hole to fit the pilot is first drilled in the forging to steady and guide the cutters of the trepanning tool. Two



Trepanning tool for side rods

cutters are employed, one a square-nosed tool as may be seen in the illustration and the other beveled on the corners and set slightly to precede the square-nose.

This combination works well to prevent clogging of the tool by chips, as no wide chips are formed. Ordinarily the tool cuts clear through the rod from one side, but on rods of more than the usual thickness, it may be found desirable to turn the work over after cutting half way through and finish from the opposite side.

Tools for all sizes of holes required in the side rods are provided, the one illustrated cutting a hole 10 in. in diameter. The cutters are about $\frac{3}{4}$ in. wide, so that a center $8\frac{1}{2}$ in. in diameter is taken out; a sizeable piece of alloy steel that is well worth saving in itself, beside the saving in time that would otherwise be expended in converting it into chips.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

The Survival of the Best Equipped

IN SPITE of diplomatic statements to the contrary, there is every evidence of the keenest competition in the automobile field. Whether or not it be called a price-war matters little. The fact remains that prices have been lowered or else improvements have been made that give greater value to the customer.

Keen competition in all lines eventually weeds out the weaker concerns. Their weakness may lie either in manufacturing or distribution costs, and mere size is no yardstick of either.

As manufacturing methods affect both the cost and quality of the car, the condition of the shop should offer a fair criterion of the ability to stand the competition. Accepting this as a method of comparison it should not be difficult for any manager to determine whether his concern will survive or fall by the wayside. A survey of his machine equipment will tell him what to expect.

If the great majority of his machines are over five years old and he cannot replace them with more modern equipment, he will be wise to keep an eye open for another job. For he will be greatly handicapped in meeting the competition of other shops and may injure his reputation by remaining.

What of the Eight Waking Hours "Outside the Fence?"

WHAT is the secret of low labor turnover? Why are men content to stay on and on with some concerns? "The sum of all the things a man gets must be more than he can get elsewhere," says the president of a company remarkably successful with its men.

One thing that every man gets for working is money. The other things are working conditions, opportunity for promotion, respect from fellow workers and executives, a good community for himself and his family to live in. He must be able to work happily and safely.

The management of the company referred to believes that it is impossible for the man himself to bring about all of the conditions mentioned, and analyzes the situation something like this: There are eight hours spent "inside the fence," at work, and sixteen hours spent "outside the fence," eight in sleep and eight in other pursuits. It is the third eight that counts most, since it may be devoted to either constructive or detrimental things. What are to be the recreations? What the social life? What the opportunities for the family, dependent as it is upon the man's attitude? These things are very important to the industries of a community, therefore it is necessary so to develop community life that the reaction toward industry will be beneficial. All of the industries of a community should co-operate, giving a combined effort toward the parks, playgrounds, home building and other things that go to make up the sum of things that the man needs to enable him to work happily. Each industry, or each shop, should provide the possibility of his working safely. When the community method is followed there is no "welfare" work; it becomes "mutual interest" work.

This reasoning is sound. Possibly it may not apply so directly in large cities as it does in the small towns, but it should be applied as far as possible. The term "mutual interest" is one that should take the place of "welfare" as an expression of the intelligently directed betterment work being done by industry to raise the calibre of its workers by providing the right kind of opportunities during the eight waking hours "outside the tence."

Carbon in Steel

CONFUSION frequently arises as to the proper method of expressing the carbon content of steel. The "point" system probably originated in the endeavor to avoid the use of decimal percentages, and was perfectly satisfactory until we began using alloys in much larger quantities than the carbon, when percentages took the place of "points," in designating alloys.

A "point" is one one-hundredth of one per cent, or one per cent is one hundred points. But when written decimally there is frequently confusion in placing the decimal point.

It is suggested that the same system be applied to both carbon and its alloys in steel, that all be expressed either in percentages or points. This would make a 3 per cent nickel read as 300 points, and so conform to the designation given the carbon content.

While those thoroughly familiar with steels probably have no difficulty at present, there is every reason to believe that there is considerable confusion in the minds of many who order or specify steel infrequently.

· SHOP · EQUIPMENT · NEWS ·

Kearney & Trecker 1400 and 2200 Series Mil-Waukee-Mils

ANNOUNCEMENT was recently made by the Kearney & Trecker Corporation, Milwaukee, Wis., of two series of sizes in which the Mil-Waukee-Mil production type milling machines, completely described on page 449, Vol. 67, of the *American Machinist*, are now available. Both series come in six varying lengths of table travel and bed. The table travels are 3, 4, 5, 7, 9 and 11 ft., respectively, and the length of bed under the table in each series ranges from 4 to 16 ft., depending upon the table length. In no case does the overhang of the table in extreme positions exceed the allowable maximum, which is figured on a conservative basis.

The 1400 series machines have a table width of 14 in., and are built in both the Simplex and Duplex type. In the article referred to, the 1400 series machine of 4 ft. table travel was described. The 2200 series machine has a wider and heavier bed and is equipped with a 22 in. table. This series is available in both the Simplex and Duplex type also.

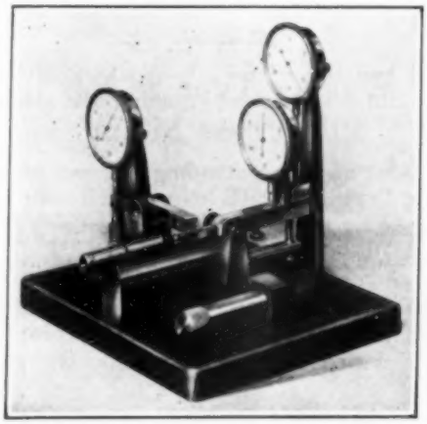
The operating features are identical in both series, and the same unit plan construction is carried out whereby any model may be equipped with standard units to accommodate the productive requirements of the user. Any of the models may be built up by units to a complete automatic machine having every combination of intermittent table feed, power rapid traverse, and spindle start and stop control. For small lot work, many of the sizes may be furnished with quick-change, selective-type speed or feed gear boxes.

In the 1400 series the machines vary in weight from 8,300 to 13,600 lb. in the Simplex models, and from 11,100 to 17,400 lb. in the Duplex models. In the 2200 series the machines vary in weight from 10,000 to 18,000 lb. in the Simplex models and from 12,800 to 20,800 lb. in the Duplex models.

Ames Special Gage

A SINGLE-PURPOSE instrument to measure valve stem bushings was recently built by the B. C. Ames Company, Waltham, Mass. The problem was to measure the external diameter of the bushing, the internal diameter, and the eccentricity of the internal diameter with respect to the external diameter. These three dimensional characteristics were to be obtained within a precision of 0.0005 inch.

The valve stem bushing is placed on the V shown, and is pushed forward, thus encompassing the double lever that lies in the plane of the longitudinal axis of the bushing. There are two dial micrometers connected to this lever, one being mounted on one part of the lever, and the other on an upright extension from the instrument base. Because both levers move, small errors due to wear of the placement surface are not introduced. The two points of the double lever contact with the bore of the bushing, one with the top, and one diametrically opposite, on the bottom. Because the dial micrometer is affixed to one lever and its spindle contacts with the other, the movement of the dial micrometer spindle is the aggregate of the movement of the pointers and, consequently, a measurement of the distance between the two pointers.



Ames Special Gage for Measuring Valve Stem Bushings

When the valve stem bushing is revolved in the V, if eccentricity exists between the internal and external diameters, the entire double lever will move up and down, and the movement will be recorded on the indicator.

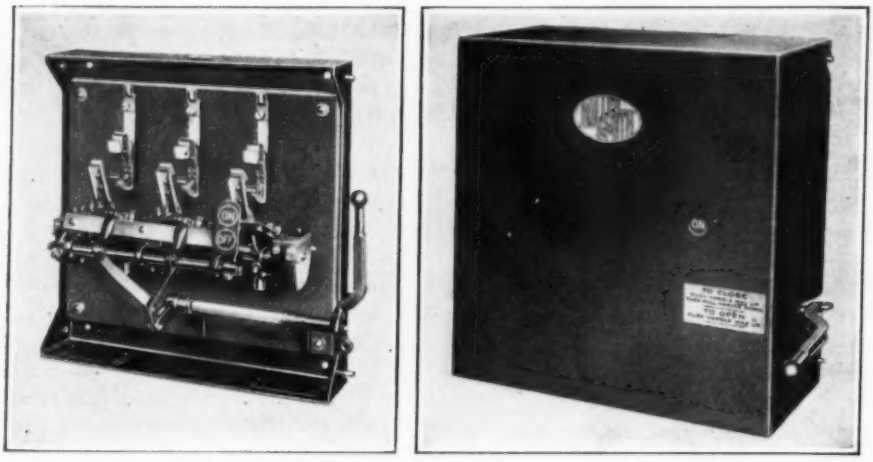
The lever shown at right angles to the longitudinal axis of the valve stem bushing contacts on the outside of the bushing as it is pushed forward and registers the outside diameter on the third micrometer. In this particular design, all settings are obtained by the use of a standard, and because it is a production measuring instrument, no adjustment is needed. However, when the product to be measured varies in dimensions, adjustment is provided for and settings can be obtained by means of size blocks or other simple measuring devices.

In actual operation, each dial has a sector shutter blocking off all of the dial but the permissible tolerance. In reading the dials thus equipped, the inspector merely looks for the arrow.

Roller-Smith Enclosed Circuit Breakers

Three types of enclosed circuit breakers were recently developed by the Roller-Smith Company, 233 Broadway, New York, N. Y. The type ESF (Enclosed Standard Type, Free-handle) circuit breaker is shown in the illustration and is recommended for all applications where an enclosed circuit breaker of the non-closable - on - overload (free-handle) style is required.

The breaker proper is the "Standard" type, but a few modifications have been made to adapt the breaker to enclosed service. The terminals are above and below and directly in line with the poles. The operating handle is located on the right and outside of the box. An "on" and "off" target on the front indicates whether the breaker is closed or open. The slate bases on which the breakers are mounted are larger than usual so as to provide plenty of space inside the box for the cables. Special precautions have been taken to provide good insulation and a sturdy, reliable, fool-proof piece of apparatus.



Roller-Smith Type ESF Circuit Breaker with cover removed and with cover in place

The boxes are made of heavy gage sheet steel enameled in maroon color. They are strong and rigid and built to withstand the large pressures generated when a breaker opens under a heavy overload or short circuit. The boxes are of the two-piece style, consisting of a rear section and a cover. The cover locks firmly in place by means of spring mounted hasps at the bottom. The cover cannot be set in place or removed unless the breaker is in the open position.

The breaker itself may be installed or removed without disturbing the rear box section and conduits. The type ESF circuit breaker is made in the single-, double-, triple-, and four-pole type from 5 to 800 amp. The type ES (Enclosed Standard) circuit breakers differ from the type ESF in that they are not of the free-handle type. The handle, instead of being located at the side, projects directly through a slot in the front of the cover. The type ES breakers are also made in styles of one to four poles, 5 to 800 amperes.

The type EI (Enclosed Industrial) circuit breakers are made in capacities 3 to 100 amp. They are similar to the type ES except that the breaker itself is the Industrial type instead of the Standard type. Type EI breakers cannot be supplied with free handles nor with time limit.

"Simplex" Screw Jacks

An improved line of screw jacks is announced by Templeton, Kenly & Co., Ltd., 1020 South Central Ave., Chicago, Ill. Instead of the solid frame, these jacks are built with an open handhole, permitting the screw of the jack to be visible at all times so that the operator may tell how far the screw has run out. The carrying handle is formed as a portion of the handhole and is braced and ribbed to add strength to the jack.

"Simplex" Screw Jack

The screw and head are forged from a single piece of steel, while the standard and cap are made of gray iron. The base is formed with an extra ribbing, providing stability and strength.

Another feature is the Duco lacquer or color finish. As an aid to more effective handling, each size is lacquered in a different color. Thirty-two sizes are available in all, ranging from 5 to 36 tons capacity, and from 8 to 29 in., closed height.

Wagner Type 58 RB Split-Phase Motor

One of the outstanding features of the Wagner 58 RB split-phase motor made by the Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo., is an improved switch capable of 500,000 starts and stops. Some of the claims made for the switch are: Breaks contact instantaneously without dragging; multiplies the contact surface; never lengthens its starting time beyond that proper for the motor; gives wiping contact without undue wear; will not warp, loosen or weaken; will not rust, bind or stick; consists of only a few simple parts.

In addition to this improved switch, the Wagner 58 RB motor embodies an improved method of oiling, a heavy formed steel base, and drip-proof end plates.

To insure freedom from vibration, the rotor slots are skewed and given a dynamic balance. The rotor bars are flat, and are folded over the end rings to assure good contact. A fan mounted on the rotor shaft is used to ventilate the motor.

Wagner Type 58 RB Split-Phase Motor

The frame is made of rolled steel, while the end plates are made of cast iron mounted directly against the frame. The beads of the end plate are accurately machined to fit the bored shoulder on the frame. The end plate can be mounted in any of four positions to facilitate attaching the motor to various appliances in any position desired. The base consists of a welded steel plate.

The bearings are oiled by long-strand wool yarn which filters as it lubricates. The oil reservoirs are so designed that the maximum amount of oil is in contact with the shaft at all times. The Type 58 RB split-phase induction motor is available in $\frac{1}{8}$-, $\frac{1}{6}$-, and $\frac{1}{4}$-hp. sizes.

Trade Catalogs

WELDED PIPING. The Linde Air Products Co., 30 East 42d St., New York, N. Y., has prepared a pamphlet on the above subject, with particular reference to plumbing and heating systems. Some typical joints are illustrated, and several illustrations are used to depict typical problems in this class of welding. The pamphlet contains 28 pages.

NEWS OF THE WEEK

Trade and Industrial Prosperity in France Affected by Depreciated Money

Metal trades must adopt mass production

BY OUR PARIS CORRESPONDENT

ONCE again industrial prosperity is affected by the instability of French financial measures. The fear of a brusque stabilization of the franc by decree has, however, been cast aside by the statement of M. Poincaré to the effect that stabilization of the currency can only result from parliamentary debate in order to meet the demands of the constitution. For the moment, this only prolongs the agony but the government may be pushed to the issue by industry becoming tired of marking time.

The franc in the last month has depreciated a few centimes as compared with the dollar. This affects a piece of imported American machinery only to the extent of approximately three dollars on a thousand dollar price tag, but it means to the importer thirty dollars on ten machines—be the units steam shovels, automobiles or turret lathes. And thirty dollars to him means seven hundred and fifty francs, a considerable factor in overhead carrying and selling charges. The American manufacturer or exporter doesn't get it, neither does the French distributor.

The French Machinery Industries Syndicate, in its annual report for 1927, states that there are employed 800,000 workers in the industry, resulting in an output valued at 25 billion francs, of which 7 billion francs worth is exported. The industry, it is claimed, can only protect itself by the *adaptation* of methods which have brought success elsewhere, America being particularly referred to. It argues for the adoption of chain production methods wherever output in large series is called for, also for normalization in reducing the number of models and parts to a minimum.

As to rationalization the French plan is not for a complete application of the principle as advanced by German manufacturers but only so far as may be possible with logical adoption which is supposed to be in keeping with French temperamental characteristics.

The above statement set forth by M. Dalbouze, the president of the syndicate, suggests what may be looked for from the French metal transforming industries once they get and keep, or advance, their pace. Above all what will aid them is their low wage scale. Example: Henry Ford pays the worker $6, the equivalent of 30 gold francs; Citreon's wage approximates 30 francs paper, something like $1.20. Just what this factor represents in an article offered in the world export market is bound to be taken into consideration by those concerned.

The claim is made that of 161 million gold marks paid to France by Germany on reparations account in 1927, the sum of 54 millions was covered by machinery and tools accepted in lieu of cash. Doubtless this accounts for the considerable drop in imports of a like nature from America during the year.

The question may well be asked as to what proportion of the 1,250,000,000 gold marks to be paid France in 1928 will be covered by the same items. The American manufacturer and exporter is here likely to find his greatest competition in the French market for some time to come.

The automobile industry is still in an equivocal situation. The new Ford announcement has reacted here much as it has in America. Actually, the various Ford models are higher in price in this market than the cars of French production with which they are supposed to compete and in every case, based on gold values, the models are priced at considerably more than double the figure at which they sell in America.

Transport and profit taking on export business, the tariff and the luxury tax of 12.5 per cent can not account for this. For the moment the French industry is taking but little account of this, at least is not taking action, but it is reasonable to believe that if a price war starts here French makers will have to cut down production costs somehow or see the Ford and Fiat industries of America and Italy get the popular car business. This cannot be done by skimping; only by advanced manufacturing methods. Renault and Citroen are best equipped for the battle, but most others, save perhaps the Peugeot firm which has recently acquired a big block of American capital, are woefully lacking in heavy output mass-producing machinery.

The figures of the American Consulate General in Paris show an increase of $10,500,000 in French exports to the United States in 1927 as compared with 1926. The total was $165,608,788. Contrariwise American total exports to France were figured at $235,300,000. There was a drop on copper of nearly 50 per cent from $21,256,000; on automobiles and parts of $450,000. Industrial machinery and tools increased to $1,494,000. These items and other imports from the United States show a falling off of $3,500,000.

The tariff schedule, as arranged by the *modus vivendi* of November last, will unquestionably brighten things up the present year if no untoward economic crisis develops in France. What is often overlooked is that American exports to France are seriously affected by the French tariff, whereas most American imports from France are based purely on the matter of taste, price and purse, the admittedly high tariff being but a talking point for the opposition.

FRENCH FOREIGN TRADE

The figures for the year's foreign trade in general, as compared with 1926, show a decrease in the value of exports of manufactured articles of 4,754,663,000 francs. Imports of food stuffs increased 2,283,102,000 francs but of manufactured articles they showed a drop of 1,784,409,000 francs.

Total imports for the year were 52,852,760,000 francs, a falling off of 6,745,561,000 francs.

Exports: 55,224,717,000 francs, a drop of 4,453,213,000 francs.

The fall on imports was 11 per cent and on exports 7.5 per cent.

Imports reached their lowest figure in August and September and their highest in December (after the accord was arrived at with the United States). The highest figures for exports were in October, November and December, the lowest in April and May.

BELGIAN AND BRITISH PROTESTS

Belgium is the latest to enter the lists demanding a bi-lateral tariff revision with France, arguing, as did the United States, that the upset accord with Germany in the latter part of 1927 was working disastrously to Belgium's metallurgical industries. The question is still on the tapis.

The British Chamber of Commerce in Paris, at its annual meeting, protested that while Britain was the best customer of France—taking one fifth of all her exports — that inquieting statistics showed that the traffic was not reciprocal. It was otherwise suggested that France take no more coal from Germany on reparations account as the

(Continued on page 318d)

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE

Editor, Commerce and Finance, New York

(Copyrighted, Theodore H. Price Publishing Corporation, 16 Exchange Place, New York)

THE news by which Wall Street was most impressed last week had to do with unemployment. In appealing for funds with which to carry on its work, one of the prominent charity organizations in New York announced that it was receiving more calls for help from the jobless than at any time since the war and that it had recently found it necessary to borrow a substantial sum in order to relieve those who were entitled to aid.

The New York State Labor Department also reports that the number of factory wage earners in the State had decreased by 66,000 during the year 1927, and the Illinois Bureau of Labor Statistics announces a decline of about 8 per cent in the industrial employment in the State since the first of January 1927.

These reports have led Governor Smith to request the Industrial Commissioner of New York to make a survey of the unemployment situation in the State. Public attention has thus been concentrated upon the subject. Its discussion has chilled optimism on the Stock Exchange. But business generally is, if anything, improving and the unemployment talk should not be taken too seriously.

This is the season of the year when the country workers are attracted to the cities. In the agricultural regions there is plenty to do and a check in the growth of our urban population would not be an unmixed evil.

The financial developments of the week have also tended to create a reactionary feeling in the security markets. The Federal Reserve Banks of Minneapolis, Kansas City, San Francisco, Dallas, and Boston, have all advanced their re-discount rates to 4 per cent. This leaves the 3½ per cent rate in force at only four banks out of the twelve, and it is altogether probable that these will soon follow the example set by Chicago.

The effect has been to strengthen the money market, and bonds as well as stocks have yielded accordingly. Most stock brokers' letters express the opinion that the gradual liquidation thus initiated will continue and that profit taking on speculatively held stocks will be wise. But in the commodity markets, as well as in the distributive trade of the country, cheerfulness still prevails.

Cotton in particular has had a sharp recovery, and the market for cotton goods shows a better tone. An unusual feature is the large number of small orders received for immediate shipment by fast freight or express. This would seem to indicate that both jobbers and retailers are bare of goods and that they may be compelled to buy somewhat precipitately if there should be a further advance in prices.

Wheat is firm and corn has advanced sharply. The tone of the grain markets is noticeably better, and the Middle West seems to be confident of the future. The markets for wool and woolen goods also appear to be in good shape, but the fall openings have not yet been held. Sugar is still in the doldrums, but the number of those who think the price has reached an irreducible minimum appears to be increasing. This is particularly true of the European sugar trade. Rubber has had a sensational decline of nearly four cents upon an official intimation that the British Premier doubted the expediency of controlling exports. A committee of investigation has been appointed, but definite action has not yet been taken. Upon coffee, comment is unnecessary. It is "stabilized" by the government, and America continues to buy from hand to mouth. The improvement in the steel industry continues at a somewhat slackened rate, although the recent advance in prices is well maintained.

Opinions with regard to the automobile business vary. Reports from Detroit would indicate that the new Ford car is not likely to be produced in quantity in the near future, and the other manufacturers are taking advantage of the delay to push their sales. But as the total production (including Ford) still appears to be under 1927, it cannot be said that the industry is working at capacity and it will have to be greatly accelerated if 5,000,000 cars are to be made and sold this year as some predict.

But the situation may change, for the business of the mail-order houses shows that the purchasing power of the West is on the increase and the chain stores everywhere show substantial gains. The multiplication of chain stores, is in fact one of the most impressive features of the present era and the announcement that a mail-order house is planning to establish a chain of 1,500 stores, has led some students of distribution to say that we may have too much of a good thing. But this suggestion has to do with a contingency that is as yet remote and the business outlook generally seems to be improving.

The foreign news is without significance. It has to do chiefly with loans that will be floated here. Australia has arranged to borrow $50,000,000 in this country, and Cuba is negotiating for a loan of the same amount. Incidentally, it is predicted that 60,000 Americans will visit Cuba this year, and our financial and political interest in our neighbors to the South of us seems to have been noticeably increased by the Havana Conference. It has had the effect of broadening the popular view of our relations and responsibilities to them and improving our sense of proportion in considering domestic developments, which might otherwise be regarded as more important than they are.

For, viewed inclusively, the outlook is satisfactory and the economic barometer still points to fair weather in that part of the world's area with which the business men of the United States are chiefly concerned.

WHAT'S DOING IN INDUSTRY

WHILE the volume of orders for machinery and machine tools has tapered off somewhat in some industrial centers, there is considerable encouragement in the number and nature of the inquiries that have appeared in the last ten days. The automotive industry is still leading the buyers' group, but general industrial users are placing orders for replacements which in the total make a rather substantial volume.

THE GENERAL improvement in Detroit continues and all indications point to better business as the various motor car builders get into production. Sales are satisfactory in Chicago and the volume of inquiries is satisfactory. Last week in Cincinnati was rather dull but prospects are fair. Farm implement and motor manufacturers are furnishing increased business in Milwaukee, and Cleveland reports a steady but conservative improvement all along the line.

SALES activity is holding up in New York and inquiries are promising. Buffalo reports a tapering off this week. The outlook in New England is encouraging and some fair sales are reported. Philadelphia dealers see a better volume in some special lines but inquiries are inactive.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW ENGLAND

The machinery and machine tool industry of the Western New England section is semi-active. A number of new inquiries were added to the list, which has steadily increased since the first of the year. The brighter side of this picture, that of turning inquiries into actual orders, more often lies in the promising future. Recent inquiries were mostly from the automotive industry, but electrical manufacturers were well represented. In the latter field a Pittsfield manufacturer is in the market for a list of several items.

Dealers in rebuilt machine tools still experience much price squabbling in spite of the fact that collections are easy. An outstanding order for used equipment was shipped by a Connecticut dealer to the Mianus Diesel Engine Co., Inc., at Stamford. The Worcester Wire Works is considering plans for an addition and the Thames Sheet Metal Works of New London will build a plant requiring stamping and cutting equipment. The outlook as a whole continues to be encouraging.

CHICAGO

While sales of machine tools for the first ten days of February have not kept pace with expectations, based on January business, the situation as a whole is reported as satisfactory. The Santa Fe R.R. continues to make its requirements known by the issue of new lists comprising a wide variety of shop equipment, lathes, grinders, planers, shapers and drills predominating. With the exception of the Santa Fe, inquiries from railroad sources thus far this year have been limited to occasional tools.

Inquiries from automotive accessory manufacturers, farm machinery and tractor builders and general industrialists are encouraging in point of volume and character, and inspire confidence with respect to early closing. Spottiness characterizes business in used tools, some of the larger concerns reporting trade as better than normal for the time of year. The Nash Motors Co., of Kenosha, Wis., is said to be contemplating the installation of new equipment for special production purposes, but nothing definite in this direction has been announced. The general machine tool situation from the sellers' standpoint is regarded as optimistic.

CLEVELAND

There has been no noticeable change in the local machinery and machine tool market during the first ten days of February. Orders are coming in a slow but steady volume. No decrease in sales is reported. Automobile manufacturers and accessories concerns were well represented in the buying. Automatic machinery producers report good business coming from pipe fitting, conduit and oil well equipment manufacturers.

Practically all concerns interviewed report an increase in sales for January over the same month of a year ago.

Inquiries are coming in more freely and the opinions are that February and March will be as good as December and January. It is noted that some inquiries are for informatory purpose as repeated follow up calls have failed to produce the order. It is the opinion that prospective customers are waiting for substantial proof of the stability of business before buying new machinery.

Production is increasing steadily. A few plants are back to normal capacity. According to an employment report issued by the American Plan Association, the employment of labor increased 29 per cent since the first of the year.

MILWAUKEE

Continued improvement is noted in the tone of the machine tool market, and while the aggregate of sales is not as yet of accustomed volume, each day's developments point toward a much more satisfactory situation. There is active inquiry from many sources, with automobile companies looming up as a more imposing figure in immediate buying. The railroad field also promises an improved demand, and general industries in the metal working field are experiencing a revival of demand for their products that usually puts life into their purchases of equipment.

There is a steady increase in the number of men at work in local foundries and machine shops. The outlook is considered better than it has been at any time in at least six months, and the immediate situation represents an improvement over a year ago.

Agricultural machinery industries occupy a favorable position and the tractor situation is particularly gratifying. The tractor division of the Allis-Chalmers Manufacturing Co. at Milwaukee is buying upwards of $150,000 worth of new equipment for a substantial increase in output this year.

BUFFALO

Final figures on January showed it to be a good month in the machine tool field in Buffalo. February opened well but there was a slight tapering off of activity in some quarters near the middle of the month. However, no one viewed this with concern and the opinion still prevails that the first half of this year is going to be fairly good.

In the electrical field, there continues to be a moderately good business through the placing of a large number of small orders for replacement and minor industrial additions to equipment. There are almost no big jobs of consequence pending at present in this district.

DETROIT

The general improvement in the machinery and machine tool market that has been apparent for the past two months is rapidly increasing. February promises to be a much better month than January, which in turn was more profitable than some of the months immediately preceding it. There is a strong feeling of optimism here, borne out to a very great extent by the receipt of many substantial orders. Inquiries are more numerous and are of a much more immediate type than formerly.

Not only the automobile manufacturers but body builders, parts makers and other allied industries are affected by the general improvement. Undoubtedly, the automobile shows have crystallized the optimism that had been growing rather steadily.

Employment is increasing steadily and a little faster within the past week. The small shops are busy and are placing orders for a variety of equipment. The entire commercial, financial and industrial structure has undergone a decided change and all the indications are that the present era will continue for some time.

NEW YORK

Dealers and agents in this territory note a tightening up in closings in the past week. General sales activity has been lessened but there seems to have been a change of heart on the part of some prospective buyers of machine tool equipment. The condition is believed to be only temporary and judging from the many inquiries that are being received from a great variety of users, there is much business to be had in the next six weeks. First quarter sales should compare favorably with those of the same period last year.

Railroad buying has not materialized and the large electrical manufacturers are buying only for replacement. Otis Elevator, Scintilla Magneto, Spicer Manufacturing Co., American Bridge Co., and the General Electric are mentioned as buyers. The Mergenthaler Linotype Co. continues to buy here and there. Some business is reported from aircraft manufacturers and much is expected of this new industry this year.

PHILADELPHIA

Some activity from the Detroit automobile centers, including purchases of plant equipment by the Ford Motor Co., and some from the steel industry, marked the machinery and machine tool situation in Philadelphia during the last two weeks. Some of the leaders reported a lack of activity, while others said the situation was more hopeful than they had anticipated. The Westinghouse and General Electric companies were among the purchasers in this market, and industrial lines from Mid-Western cities were listed as buyers.

Producers of shapers, millers, forging hammers, gears, and steel window and door equipment for industrial plants, reported a fair volume of business during the last fortnight, but there was indication to some that the activity was somewhat sporadic.

This belief was based upon a lack of substance back of inquiries, which were few and appeared to be lacking in prospects for orders.

CINCINNATI

Taking the machine tool industry of the Cincinnati district as a whole, business was rather dull in the past week and failed to come up to expectations. However, a few concerns report an increase in sales. Selling agents report that while they have a large amount of business pending, they were not able to book enough orders in the past week to constitute a gain that is worthy of special mention.

A slightly increased amount of business from the automotive industry and allied trades is reported as having been received in the week by some manufacturers. The sustaining feature of the week's business was orders for single tools and replacements, placed by general machinists and miscellaneous users. Railroad purchases were confined to single tools for replacement.

The majority of manufacturers and selling agents report that a good volume of inquiries came in during the week, the greater portion of them being from general machinists and miscellaneous users and in regard to single tools and replacements.

Westinghouse Veterans Hold Banquet

The fifteenth annual banquet of the Westinghouse Electric and Manufacturing Co.'s Veteran Employees' Association was held on the evening of Feb. 4 in Pittsburgh. Approximately 2,000 men and women veterans attended. The chief speaker was Secretary of Labor James J. Davis, who declared that at 50 or 60 years of age, a man or woman is just as capable a worker as at 30.

Secretary Davis' address was preceded by a unique program in honor of the 3,000 men and women who have served in the Westinghouse employ upwards of 20 years, their combined service totaling more than 700 centuries. Felicitations from the company's board of directors and executive staff were conveyed by E. M. Herr, president, and F. A. Merrick, vice-president and general manager. E. S. McClelland, director of personnel, was toastmaster.

One woman and 54 men, whose employment dates from the earliest days of the Westinghouse company, were presented with jewelled emblems marking the completion of 40 years of service. Interesting facts about the launching of the company, the struggle for existence of the then infant industry, and early associations with George Westinghouse, whose inventive genius paved the way for the company's growth, were recalled by these veterans as they gathered for the ceremony.

Announcement of the newly-elected officers of the Veteran Employees' Association, was made by L. E. Schumacher, retiring president, as follows: E. C. Brandt, president; Alexander Taylor, vice-president; C. Hays Long, secretary; E. W. Davis, treasurer; trustees, J. H. Gibson, F. C. Hering and David George.

Commerce Yearbook on Foreign Countries

Complying with a demand for a convenient book of information on current economic conditions in foreign countries, the Department of Commerce has issued, as a second volume of its annual *Commerce Yearbook*, a compilation of facts and figures on sixty-one different markets. This is the first time surveys of this kind have ever been compiled in a single volume.

Among the subjects discussed in the book are foreign trade, finance, currency, price movements, labor conditions and other matters affecting the general business situation. Statistical data on population, education, births and deaths, climate, etc., are also included. According to Dr. Julius Klein, director of the bureau of foreign and domestic commerce, these economic reviews and statistics should prove of great service to American business in the promotion of foreign trade and of safe investment of capital in foreign countries.

The assembling and collating of the varied material in this first foreign commerce yearbook, it is pointed out, has been a task of considerable magnitude, involving as it did not only current statistics but also those of previous years.

Industrial Machinery Exports Gained in 1927

United States exports of industrial machinery in 1927 reached a total value of $180,000,000 and exceeded shipments for any year since the abnormal post-war volume of 1921, according to the industrial machinery division of the Department of Commerce. Compared with the 1926 total of $156,618,000 this trade represents a gain of 15 per cent.

Classes of machinery which played the principal rôle in swelling the 1927 exports were metal-working and construction and conveying machinery. Exports of metal-working machinery were valued at $25,397,000, compared with $18,868,000 in 1926, and exceeded those for any year since 1920. This is regarded especially, encouraging by the trade following the decline of more than $3,000,000 in 1926 as compared with the shipments of the previous year.

Exports of construction and conveying machinery reached a total value of $19,126,000, a very substantial gain over the $17,047,000 figure for 1926. Shipments of this class of machinery have shown steady increases ever since 1922, when they totaled only $7,300,000. Following that year exports rose by more than $1,000,000 each year, until in 1926 the gain was in excess of $2,300,000. In 1927 this upward trend continued, with a gain of more than $2,000,000 as compared with 1926. The largest increase in this group occurred in exports of excavators, including power shovels, which rose from $3,352,000 in 1926 to $4,842,000 in 1927. Shipments of excavator parts and accessories expanded from $1,153,000 to $1,782,000 during the same period. Exports of concrete mixers increased from $737,124 to $1,130,606, and cranes with swinging booms from $770,103 to $928,551. The experience in the case of dredging machinery ran quite counter to this general upward trend, exports falling from $1,225,334 to $550,313.

Textiles Recoup Loss

In the case of textile machinery, the decline in exports which had continued without interruption during the three years preceding was broken in 1927, when exports totaled $11,466,000 compared with $10,400,000 in 1926. Shipments of industrial or factory sewing machines had declined slightly in 1926, but rose strongly in 1927, reaching a total value of $4,369,000 as compared with $3,123,000 in 1926. Similarly exports of shoe machinery had declined slightly in 1926, but the 1927 export value of $1,718,000 represented an appreciable gain over the $1,353,000 trade in 1926.

Bridgeport Ready for Sales Exhibit

Plans have been completed for the co-operative exhibit of the Salesmen's and Purchasing Agents' Association of America, which will be held in Bridgeport, Conn., Feb. 24 and 25. The Pyramid Temple Mosque will house the exhibits, which at the present time number about eighty from the leading manufacturers of small tools, steels, electric equipment, platers' supplies, hardware, paints, varnish and general factory supplies.

Among the exhibitors are the following which come within our field: Aluminum Co. of America, American Hardware Co., American Pulley Co., American Swiss File and Tool Co., Bay State Tap and Die Co., Bridgeport Airport, Inc., Bunting Brass and Bronze Co., Bridgeport Brass Co., the Black & Decker Manufacturing Co., Brown & Sharpe Manufacturing Co., Bryant Electric Co., Graybar Electric Co., Inc., General Electric Co., Heppenstall Forge Co., Hartford Belting Co., Hilo Varnish Co., Ludlum Steel Co., Midvale Steel Co., Johns-Mansville Co., Norton Co., Skinner Chuck Co., S.K.F. Industries, Trumbull Electric Manufacturing Co., Vanadium Alloy Steel Co., and Westinghouse Manufacturing Co.

Trade and Industrial Prosperity in France

(*Continued from page 318a*)

British mining industry and miners alike were suffering from this very circumstance.

The financial situation is dominated by that of interior and foreign politics. Franc stabilization, before or after the spring elections, is something which is uppermost in all industrial and trading circles. The mid-January Bank of France statement showed a banknote circulation increased by 2,088,558,000 francs since the first of the year. This, by whatever term it may be officially referred to, is inflation. The total circulation of 58,639,166,000 francs is actually hitting the ceiling which has been established by law.

French railways have been empowered by the government to raise freight rates to cover, what, in the case of three important lines, are deficits in operation and secondly to raise wages of employees. As an example of the latter locomotive engineers may now earn as high as 25,000 francs per annum.

Chambers of Commerce have been protesting loudly. That of Nancy, the center of French metallurgy, proclaims forcibly that increased freights will bring a slowing down of business in heavy lines and a consequent diminution of traffic and in the long run of freight receipts. It claims also that industry cannot stand further freight surcharges which with taxation to excess are already the cause of much of the malaise throughout industrial France.

Personals

C. H. BRANDES, president of the International Process and Engineering Corporation, sailed for Europe, Feb. 8.

F. A. MOSELEY has been appointed general sales manager of Sawyer-Massey, Ltd., with headquarters at Hamilton, Ontario.

LIEUT. RALPH S. BARNABY has been made assistant general inspector of naval aircraft, Wright Field, Dayton, Ohio.

W. J. SCHUHMANN, who has been sales engineer at the New York office of the Roller-Smith Co., has been transferred to the company's works at Bethlehem, Pa.

R. S. CARTER, president of the Latrobe Tool Co., of Latrobe, Pa., sailed for South America on Feb. 9. He will combine business with pleasure in an extended tour of that country.

T. M. MANLEY has been appointed manager of the district including Northern New York, Vermont, and part of Massachusetts and Pennsylvania for the Morse Chain Co., of Ithaca, N. Y.

H. W. DILLON, formerly sales engineer, Chicago Pneumatic Tool Co., Philadelphia, Pa., has accepted a similar position with the Gold Car Heating and Lighting Co., New York.

ARTHUR DUFTY, for many years superintendent of buildings and purchasing agent at Purdue University, and also for three years business manager at Oberlin College, has taken the position of assistant to the president of the Bantam Ball Bearing Co., of Bantam, Conn. He will relieve W. S. Rogers, president, of all the details of direct management.

DONALD M. RYERSON, vice-president and general manager, has been elected chairman of the board of directors of Joseph T. Ryerson & Son, Inc. He succeeds his father, Edward L. Ryerson, Sr., who died Jan. 19. Edward L. Ryerson, Jr., vice-president in charge of plant operations and several sales divisions, succeeds Donald Ryerson as vice-president and general manager. Everett D. Graff has been elected a vice-president.

W. E. PHIN, president of the Dominion Power and Transmission Co., of Hamilton, Ontario and RUSSELL D. BELL, of the Greenshields Co., of Montreal, have been added to the board of directors of the National Steel Car Corporation. Mr. Phin succeeds Donald Symington, of Baltimore, one of the company's vice-presidents, who has resigned, while Mr. Bell takes the place of L. B. Churchill, former secretary-treasurer of the company, who died a few years ago.

Business Items

The Circuit Court has ordered the sale of the plant of the Davis Boring Tool Co., at 3693 Forest Park Blvd., St. Louis. The date of the sale has been set for March 7.

The American Electric Switch Corporation, of Minerva, Ohio, has acquired the Nyelec Switchboard Co., of New York. The latter company will operate as a division of the former organization and will retain its New York offices, factory and personnel.

Leeds, Tozzer & Co., Inc., 75 West St., New York City, has been appointed special sales representative for the Thew Shovel Co., of Lorain, Ohio, and the Universal Crane Co., of Elyria, Ohio, for the eastern railways of the United States.

The Hannifin Manufacturing Co., of Chicago, has been reorganized. A new group of executives headed by V. W. Peterson, president, and C. B. Mitchell, vice-president and treasurer, have taken over the plant and business and will continue the manufacture of air chucks, air operated arbor presses, boring bars and other air operated devices.

The Wagner Electric Corporation, of St. Louis, announces the opening of a new branch sales office at 475 West Peachtree St., Atlanta, Ga., to cover the three states of Georgia, Alabama and Florida. Roy F. Druschky, until recently a salesman in the St. Louis territory, has been put in charge of this office. This year marks the sixteenth year Mr. Druschky has been with the Wagner Electric Corporation, during which time he has been connected with several departments.

The Westinghouse Electric and Manufacturing Co. announces the following changes in personnel: W. J. Longmore has been transferred from the office of general purchasing agent to consulting supervisor of purchases; E. R. Norris, from director of works equipment to general works manager of all manufacturing operations; A. W. Bass, from director of works records and statistics to assistant to the vice-president; S. E. Marks, from director of traffic and shipping to director of traffic; and C. G. Taylor from director of purchases to general purchasing agent.

Obituaries

ISAAC G. OGDEN, vice-president of the Canadian Pacific Ry., died at Montreal, Quebec, on Feb. 4. He was 84 years old.

DR. WILLIAM C. L. EGLIN, widely known electrical engineer, and president of Franklin Institute, died in Philadelphia on Feb. 7. Dr. Eglin was vice-president and chief engineer of the Philadelphia Electric Co., and was largely responsible for the hydro-electric development at Conowingo, Md.

HOWARD A. WINTON, general manager of branches of the Heil Co., Milwaukee, manufacturer of steel truck bodies, tanks and hydraulic hoists, died on Feb. 7 after a short illness. Mr. Winton was president of the Milwaukee Industrial Advertisers' Association.

RICHARD HENRY PASCAL, president of the Pickering Governor Co., Portland, Conn., died on Feb. 6 at his home in that city. Mr. Pascal was 87 years old. He joined the Pickering company in 1865, became superintendent in 1878, and was elected president in 1902 to succeed the late John H. Hall. He was a member of the American Society of Mechanical Engineers.

Calendar of Local Meetings

National Association of Cost Accountants

Baltimore Chapter. April 17. Subject: "The Budget in Manufacturing—Application of Budgetary Principles and Their Performance."

Boston Chapter. April 26. Subject: "Cost and General Accounting Procedure for a Paper Mill," by Homer A. Sargent.

Buffalo Chapter. April 26. Hotel Buffalo. Subject: "Debatable Questions in Industrial Accounting." By Clarence S. Marsh.

Cincinnati Chapter. April 17. Subject: "Accounting for Value of Fixed Assets," by H. G. Baldwin.

Chicago Chapter. April 19. Subject: "What the Sales Department Wants From the Accountant," by V. Frank Banta.

Change in Date

Announcement has been made by the Supply Association of the American Railway Tool Foremen's Association that the date for its annual convention has been changed to Sept. 12, 13 and 14. It was necessary to make this change in order that a large number of exhibitors at the show could hold the same space for the general foremen's convention which is to be held Sept. 18 to 21. Both conventions will be held in the Hotel Sherman, in Chicago. F. A. Armstrong, of the Pratt & Whitney Co., 504 W. Monroe St., Chicago, is secretary of the Supply Association.

Forthcoming Meetings

American Institute of Mining and Metallurgical Engineers. Annual meeting of the Institute of Metals Division, Engineering Societies Bldg., New York City, Feb. 20 to 23. H. Foster Bain, secretary, 29 West 39th St., New York.

National Safety Council. Mid-West Safety Conference, Chicago, March 19. A. A. Mowbray, director of publicity, 108 E. Ohio St., Chicago.

American Gear Manufacturers' Association. Twelfth annual meeting, Rochester, N. Y., April 19, 20 and 21, Hotel Seneca. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

American Welding Society. Annual meeting, week of April 23, New York City. M. M. Kelly, secretary, 33 West 39th Street, New York City.

American Railway Association. Schedule of sectional meetings: Division IV, Engineering, March 6 to 8, Chicago; Division V, Mechanical, June 13 to 20, Atlantic City, N. J.; Division VI, Purchases and Stores, June 13 to 15, Atlantic City, N. J.

National Metal Trades Association. Thirtieth annual meeting, Hotel Astor, New York, April 25 and 26. J. E. Nyham, secretary, Peoples Gas Bldg., Chicago, Ill.

National Foreign Trade Council. Fifteenth anniversary convention, Houston, Texas, April 25, 26 and 27. O. K. Davis, secretary, India House, Hanover Square, New York.

American Foundrymen's Association. Convention and Exhibit, Philadelphia, May 14 to 18. Technical Sessions at Hotel Belleview-Stratford; exhibit at Commercial Museum. R. E. Kennedy, secretary, 140 So. Dearborn St., Chicago.

National Association of Purchasing Agents. Annual meeting and "Informashow," Kansas City, Mo., May 28 to 31. W. L. Chandler, secretary, 11 Park Place, New York.

Association of Iron and Steel Electrical Engineers. Annual meeting, Stevens Hotel, Chicago, June 25 to 29. J. F. Kelly, managing director, Empire Bldg., Pittsburgh, Pa.

American Society for Testing Materials. Annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 25 to 29. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia, Pa.

Society of Automotive Engineers. 1928 Summer Meeting, Chateau Frontenac, Quebec, Canada, June 26 to 29. C. E. Heywood, in charge of meetings, 29 West 39th St., New York.

American Railway Tool Foremen's Association. Annual meeting, Hotel Sherman, Chicago, Sept. 12, 13 and 14. G. G. Macina, secretary, 11402 Calumet Ave., Chicago.

American Railway Tool Foreman's Association. Sixteenth annual convention of the Supply Association, Hotel Sherman, Chicago, Sept. 12, 13 and 14. F. A. Armstrong, secretary, the Pratt & Whitney Co., 564 W. Monroe St., Chicago.

American Society for Steel Treating. "National Metals Exposition," Commercial Museum, Philadelphia, Pa., week of Oct. 8. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

NON-FERROUS metals prices tend downward in direct contrast with the trend in steel. Tin is at lowest level reached in the last three years. Scrap is down with the exception of certain descriptions of copper. January unfilled orders at mills of the U. S., were 10 per cent over those of the corresponding period in 1927. Steel ingot output in January gained 5 per cent over the first month of last year. Further improvement in the steel market is seen in advances of $2 per ton on cold finished bars at mill and galvanized sheets in Cleveland warehouses. Automotive, railway, and construction demand for steel continues active.

(All prices as of Feb. 10)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b:

CINCINNATI	
No. 2 Southern	$21.44
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	16.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	21.26
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.80
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities rom warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10@2.20	3.50	3.25	3.89
No. 12	2.15@2.25	3.55	3.30	3.94
No. 14	2.20@2.30	3.60	3.35	3.99
No. 16	2.30@2.40	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.70@2.80	3.75	3.55	4.00
No. 22	2.85@2.95	3.90	3.70	4.15
No. 24	2.90@3.00	3.95	3.75	4.20
No. 26	3.00@3.10	4.05	3.85	4.30
No. 28	3.15@3.35	4.20	4.00	4.45
Galvanized				
No. 10	2.95@3.05	4.10	3.90	4.25
Nos. 12 to 14	3.05@3.15	4.20	4.00	4.35
No. 16	3.15@3.25	4.30	4.10	4.45
No. 18	3.30@3.40	4.45	4.25	4.60
No. 20	3.45@3.55	4.60	4.45	4.75
No. 22	3.50@3.60	4.65	4.50	4.80
No. 24	3.65@3.75	4.80	4.60	4.95
No. 26	3.90@4.00	5.05	4.85	5.20
No. 28	4.15@4.25	5.30	5.10	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to.30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness — Decimal	B.w.g. and Fractions	Outside Diameter in Inches — ¼	⅜	½	¾	1	1¼	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	18	.19	.20	.21	.23	.25
.065"	16	.19	20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	....	4.65
Spring steel, heavier	4.00	....	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	5.70	6.10
Floor plates	5.25	5.30	5.00
Cold drawn, round and hex.†	3.30	3.65	3.60
Cold drawn, flats and squares	3.80	4.15	4.10
Structural shapes	3.34	3.00	3.10
Soft steel bars	3.24	3.00	3.00
Soft steel bar shapes	3.24	3.00	3.00
Soft steel bands	3.99	3.65	3.65
Tank plates	3.34	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, ⅜", 8.35c.; ¼", 7.85c.; 5/32" to ⅛" 7.35c. per lb. *Flat, 1/16@¼-in. thick. †Also shafting and screw stock.

METALS

Current Warehouse Prices in Cents Per Pound for Small Lots

Copper, electrolytic, up to carlots, New York	15.37½		
Tin, pigs, 5-ton lots, New York	54.87½		
Lead, pigs, up to carlots, E. St. Louis	6.20	New York	7.10
Zinc, slabs, up to carlots, E. St. Louis	5.62½	New York	6.55

	New York	Cleveland	Chicago
Antimony, slabs, ton spot	13.50	13.87½	14.25
Copper sheets, base	22.75	22.75	22.75
Copper wire, base	19.37½	19.37½	15½@15¾*
Copper bars, base	22.25	22.25	22.25
Copper tubing, base	24.50	24.50	24.50
Brass sheets, high, base	18.75	18.75	18.75
Brass tubing, high, base	23.62½	23.62½	23.62½
Brass rods, high, base	16.50	16.50	16.50
Brass wire, high, base	19.25	19.50	19.25

*Mill

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 99%, 1 to 15 ton lots	24.30	26@27	24.03
Zinc sheets (casks)	11.00	12.65	10.36
Solder (½ and ½), (case lots)	34.25	35.50	33@37

Babbitt metal, delivered, New York, cents per lb.:

Genuine, highest grade	71.00
Commercial genuine, intermediate grade	61.00
Anti-friction metal, general service	31.50
No. 4 babbitt (f.o.b.)	12.50

Nickel, f.o.b. refinery, cents per lb.:

Ingots	35.00	Electrolytic	37.00
Shot			36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	45.00
Cold drawn rods, Grade "A" (base)	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	28.00	Hot rolled rods (base)	35.00
Blocks	28.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible copper	12.25 @12.50	11.50	11.00@11.50
Copper, heavy, and wire	11.50 @12.25	10.75	10.50@11.00
Copper, light, and bottoms	10.25 @10.75	9.50	9.25@ 9.75
Heavy lead	5.00 @ 5.25	5.25	4.50@ 5.00
Tea lead	4.00 @ 4.25	3.75	3.50@ 4.00
Brass, heavy, yellow	7.12½@ 7.37½	7.25	7.00@ 7.50
Brass, heavy, red	9.00 @ 9.50	9.75	9.00@ 9.25
Brass, light	5.50 @ 6.00	5.75	6.00@ 6.50
No. 1 yellow rod turnings	7.25 @ 7.75	7.50	7.00@ 7.50
Zinc	3.25 @ 3.50	3.25	2.50@ 3.00

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.10	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	.12	.12@.17
Wiping cloths, washed white, per lb	.15½@17½	38.00 per M	.15
Sal soda, per lb	02	02	.02¾
Roll sulphur, per lb	027	.03½	04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots	.76½	.86	.78
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	.65	.50	.50
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.	.27	.35	26
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	†35%	35%	35%
Heavy grade	†30%	30%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	45%	50–10%	50%*
Second grade	50%	60–5%	50–10%†

*Large quantities, 40%. †Large quantities, 60-10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.033	.033	.04
Brass rods	per lb.	.165	.165	.1562½
Solder (½ and ½)	per lb.	3425	.3675	.42
Cotton waste, white	per lb.	.10@13½	.10@.13½	.13@.17½
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.10	3.10	3.10
Lard cutting oil	per gal.	.65	.65	.55
Machine oil	per gal.	.27	.27	33
Belting, leather, medium	off list	35%	35%	40-5%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper	$5.40	$4.95	$5.13
*Emery paper	10.71	9.15	10.71
*Emery cloth	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper	1.29	1.27	1.32
Cloth	3.10	3.05	3.05
Fire clay, per 100 lb. bag		.75	.75
Coke, prompt furnace, per net ton		Connellsville, 2.65@3.00	
Coke, prompt foundry, per net ton		Connellsville, 3.75@4.50	
White lead, dry or in oil	100 lb. kegs	New York, 13.75	
Red lead, dry	100 lb. kegs	New York, 13.75	
Red lead, in oil	100 lb. kegs	New York, 15.25	

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in	55%
Larger up to 1 x 30-in	50%
1¼ and 1½ in. dia	35%
Carriage bolts:	
Up to ½ x 6-in	55%
Larger sizes	50%
Coach and lag screws:	
Up to ½ x 6-in	55%
Larger sizes	50%
Tap bolts, hexagonal heads	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in., incl	55%
Semi-finished, hexagonal, tapped, in packages, all sizes	40%
Case hardened, hexagonal, tapped, in packages, all sizes	30%
Washers: Deduct from list, per 100 lb	$3.50*
Rivets, button and cone head:	
Small, including ⅞-in. dia	50–10%
Large (base) per 100 lb. net	$5.00†

Note—For less than case or keg quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.

*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

Mass., Boston—The Boylston St. Land Co., 1286 Boylston St.—miscellaneous tools and equipment for proposed repair and service garage. Estimated cost $40,000.

Mich., Birmingham—Studebaker Service, 203 Pierce St.—complete machine shop equipment including lathe, drill press, grinder, etc., for general repair work.

Mich., Detroit—Dpt. of Purchases & Supplies, 710 Marquette Bldg., J. E. Mills, Comr.—one 100 lb. power blacksmith's hammer, electrically driven, capacity up to 1¼ in. stock with 5 hp. motor, weight to approximate 3,600 lbs.

Mich., Detroit—Electric Sprayit Co., 217 Iron St.—one 12 x 14 in. quick change lathe, one No. 2 Barton & Oliver lathe with turret feed, one No. 2 Warner & Swasey lathe with turret feed, and one ball bearing two-spindle Allen drill press.

Mich., Detroit—Jeschke Tool Co., 14220 Mack Ave., H. A. Jeschke, Purch. Agt.—lathe and equipment for machine and blacksmith shop.

Mich., Detroit—F. Johnson, 4251 Cass Ave.—expansion reamers for piston work, also garage and machine shop equipment.

Mich., Detroit—Koestlin Tool & Die Co., 3601 Humboldt Ave., H. J. Koestlin, Purch. Agt.—15 ton traveling crane, and equipment for addition to tool and die shop.

Mich., Detroit—Mid West Tool & Mfg. Co., 2360 West Jefferson Ave.—cutter and grinder for machine shop.

Mich., Detroit—Midwest Wire Products Co., 5301 St. Aubin Ave. (wire frames, etc.)—spot welder and equipment for ¼ in. material.

Mich., Grand Rapids—Hayes-Ionia Co., Seventh and Muskegon Sts., H. J. Hayes, Pres.—miscellaneous tools and equipment for proposed addition to metal shop.

Mich., Detroit—Superior Seal & Stamp Co., 151 East Jefferson Ave.—machinery and equipment for the manufacture of steel seals and stamps for proposed 1 and 2 story stamp factory on Porter St. Estimated cost $65,000.

Mo., Kansas City—Sheffield Steel Corp., Sheffield—machinery and equipment including lathes, etc., for the manufacture of steel.

O., Wellston—Wellston Mfg. Co., H. D. Wendell, Pres.—complete machinery and equipment for pattern factory recently destroyed by fire.

Tex., Harlingen—M. A. Mundry—machinery and equipment for general auto repairing for proposed 1 story, 100 x 140 ft. garage and service building. Estimated cost $65,000.

Opportunities for Future Business

Calif., Los Angeles — Auburn Automobile Assn., E. L. Cord, Pres., awarded contract for a 5 story, 20 x 140 ft. garage and sales and service building at Wilshire St. and Maripose Ave. Estimated cost $600,000.

Calif., Salinas—F. E. Heple, c/o Heple Garage, is having plans prepared for a 1 story, 110 x 220 ft. garage and service building at Alisal and Monterey Sts.

Calif., Santa Ana—H. D. Riley, 151 South Los Angeles St., Anaheim, will build a 1 and 2 story, 125 x 150 ft. garage on Myrtle St. here.

Ill., Chicago—Johnson Furnace & Sheet Metal Works, 712 West 79th St., awarded contract for a 1 story, 57 x 121 ft. shop. Estimated cost $12,000.

Ind., Indianapolis—Test Realty Co., c/o Bishop - Knowlton - Carson, 312 North Meridian St., Archts., will soon award contract for a 3 story, 100 x 165 ft. garage at 1452 North Pennsylvania St. Estimated cost $175,000. Noted Nov. 10.

Ind., Vincennes—Lanahan & Dumphy, is having plans prepared for the construction of a garage and repair shop. Estimated cost $100,000. Private plans.

Ia., Boone—Otis Lumber Co., Boone, Ia., awarded contract for a 1 story, 100 x 136 ft. lumber plant. Estimated cost $50,000.

Ky., Camp Nelson (mail Bryantsville)—Quartermaster Depot, Jeffersonville, Ind., will receive bids until Feb. 25 for a new tool and storage building at Camp Nelson National Cemetery, here.

Md., Baltimore—The Glenn L. Martin Co., 16800 St. Clair St., Cleveland, O., plans the construction of first unit of airplane factory, here. Estimated cost $1,500,000.

Mass., Arlington (Boston P. O.)—W. F. McManus, 15 Mill St., awarded contract for a 1 story, 60 x 100 ft. repair and service garage on Mystic St. Estimated cost $40,000. Noted Jan. 26.

Mass., Becket—M. E. Ballou & Sons, J. C. Ballou, Pres., Main St., plans to rebuild basket factory. Architect not selected.

Mass., Boston—Charles St. Garage Corp., L. K. Morse, Pres., plans the construction of a 2 story addition repair and service garage at 252 Cambridge St. Estimated cost $50,000. Lockwood, Greene & Co., 24 Federal St., Boston, Archts.

Mass., Framingham — H. J. Porter, 181 Concord St., is having sketches made for a 1 story repair and service garage on Union St. Estimated cost $40,000. Private plans.

Mass., Newton (Boston P. O.)—Abramson & Bennett, Taylor Bldg., Auburn St., Auburndale, had plans prepared for a 1 story, 60 x 100 ft. repair and service garage at Auburn and Lexington Sts. here. Estimated cost $50,000. J. A. Tuck, 164 Lincoln St., Boston, Archt.

Mass., Waltham (Boston P. O.)—J. Totten & Sons, 74 Beacon St., is having sketches made for a 1 story, 50 x 200 ft. garage and repair shop on Winter St. Estimated cost $40,000. Private plans.

Mich., Detroit—Packard Motor Car Co., East Grand Blvd., awarded contract for a 1 story, 144 x 420 ft. stamping plant on Bellevue Ave.

Mich., Grand Rapids — Wilcox Kuennen Co., 317 Bond St. N. W., awarded contract for a 2 story, 100 x 200 ft. garage on Ionia St. Estimated cost $100,000.

Mo., Anglum—Curtis-Robertson Airplane Mfg. Co., c/o St. Louis Flying Field, St. Louis, is having revised plans prepared for the construction of a 60 x 250 ft. factory including 40 x 60 ft. woodworking and storage building, 40 x 60 ft. paint shop, etc., here. Estimated cost $75,000. McDonald & Condie, 502 North Taylor Ave., St. Louis, Archts. Noted Jan. 26.

Mo., Anglum—B. F. Mahoney & Co., San Diego, Calif., will receive bids about Mar. 1 for the construction of an airplane factory including 40 x 60 ft. paint shop, etc., on Near St. Estimated cost $75,000. McDonald & Condie, 502 North Taylor Ave., St. Louis, Archts.

N. J., New Brunswick—A. Weingart, 114 Church St., plans the construction of a 6 story garage on Church St. Estimated cost $150,000. Architect not announced.

N. J., Paterson—Cowego Realty Co., L. Gottlieb, Pres., East 27th St., is receiving bids for a 2 story, 215 x 250 ft. garage on Ellison Pl. Estimated cost $250,000. A. E. Sleight, Romaine Bldg., Archt. Noted Sept. 15.

N. J., West New York—N. Buchiarelli, 231 17th St., will not construct 2 story, 40 x 100 ft. woodworking shop. Project abandoned. Noted Jan. 5.

N. Y., Brooklyn—C. F. R. & R. Realty Corp., B. Cohen, Pres., 131 15th St., had plans prepared for a 3 story, 50 x 100 ft. service garage. Estimated cost $126,000. E. M. Adelsohn, 26 Court St., Archt.

N. Y., Flushing—G. E. Watson, Barclay St., had plans prepared for a 4 story garage at 16th and Barclay Sts. Estimated cost $100,000. Private plans.

N. Y., New York—Consolidated Gas Co., G. B. Cartelyon, Pres., 130 East 15th St., had plans prepared for a 4 story, 100 x 109 ft. garage at 157 Hester St. Estimated cost $400,000. Architect not announced.

N. Y., New York—Fort Lee Ferry Corp., H. Friedman, Pres., 900 Riverside Dr., had plans prepared for a 125 x 205 ft. garage at Bailey Ave. and Kingsbridge Rd. Estimated cost $50,000. G. G. Miller, 1482 Broadway, Archt.

N. Y., New York—Four Thousand Five Hundred Ten Broadway Corp., F. Rudinger, Pres., plans the construction of a 102 x 105 ft. garage at Jerome and Mt. Eden Aves. Estimated cost $72,000. J. J. Dunnigan, 2382 Grand Concourse, Archt.

N. Y., New York—Stephen-Thouret Holding Co., Inc., M. Thouret, Pres., 2178 Broadway, had plans prepared for a 6 story garage at 206 West 77th St. Estimated cost $225,000. J. L. Steinam, 46 West 46th St., Archt.

N. C., Charlotte — Motor Storage Corp., awarded contract for the construction of a 5 story auto storage building on Church St. Estimated cost $200,000.

N. D., Minot—Stearns Motor Co., is having plans prepared for a 3 story, 106 x 143 ft. garage. Estimated cost $65,000. Bugenhagen & Molander, Union National Bank Annex, Archts.

O., Cincinnati—Ninth St. Garage Co., 34 West 6th St., will soon award contract for an 8 story, 90 x 184 ft. garage at Ninth and Walnut St. Estimated cost $1,000,000. Tietig & Lee, 34 West 6th St., Archts.

O., Columbus—W. B. Zimmerman, 552 East State St., awarded contract for a 1 story, 60 x 137 ft. repair garage at Second Ave. and High St. Estimated cost $30,000.

Pa., Allentown—Sacred Heart Hospital, 421 Chew St., plans a 4 story, 100 x 130 ft. service building at 4th and Chew Sts. Jacoby & Everett, Commonwealth Bldg., Archts.

Pa., Philadelphia—H. Ditkow, H. Montague, J. Cohen & A. Wach, c/o Silverman & Levy, 313 South Smedley St., Archts., are having plans prepared for a 4 story, 93 x 108 and 18 x 65 ft. garage at Ludlow St. between 18th and 19th Sts.

R. I., Cranston—City Lease & Building Co., c/o G. B. Long, 470 Atlantic Ave., Boston, Mass., is having plans prepared for the construction of a bakery including 60 x 100 ft. garage, etc., here. Private plans. Great Atlantic & Pacific Tea Co., Somerville, Mass., lessee.

R. I., Newport—H. L. Rooney, 116 Bellevue Ave., is receiving bids for a 1 story repair and service garage on Middleton Ave. Estimated cost $40,000. Private plans. Noted Oct. 20.

Texas—Phillips Petroleum Co., Bartlesville, Okla., will build three plants for the manufacture of carbon black from residue casinghead gas to include machine shops, etc., in Hutchinson, Carson and Gray counties, here. Estimated cost $200,000 each. Private plans.

Wash., Seattle—Queen City Improvement Co., awarded contract for a 6 story, 90 x 108 ft. garage at 1913 5th Ave. Estimated cost $150,000.

Ont., Ottawa—Bell Telephone Co., Queen St., will soon receive bids for a 2 story, 100 x 125 ft. garage, etc. on Preston St. Estimated cost $100,000.